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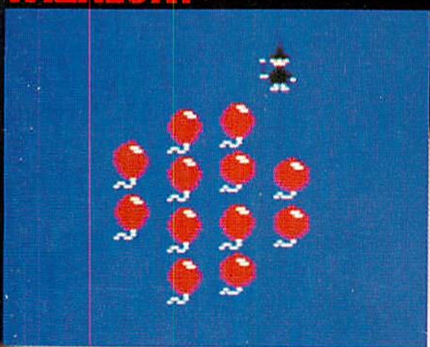
JANUARY 1988

BIGGEST AND BEST-SELLING BBC/ACORN MAGAZINE

STEP BY STEP:
Drawing on a BBC with Super Art

PORTABLES:
Transfer files from the Z88

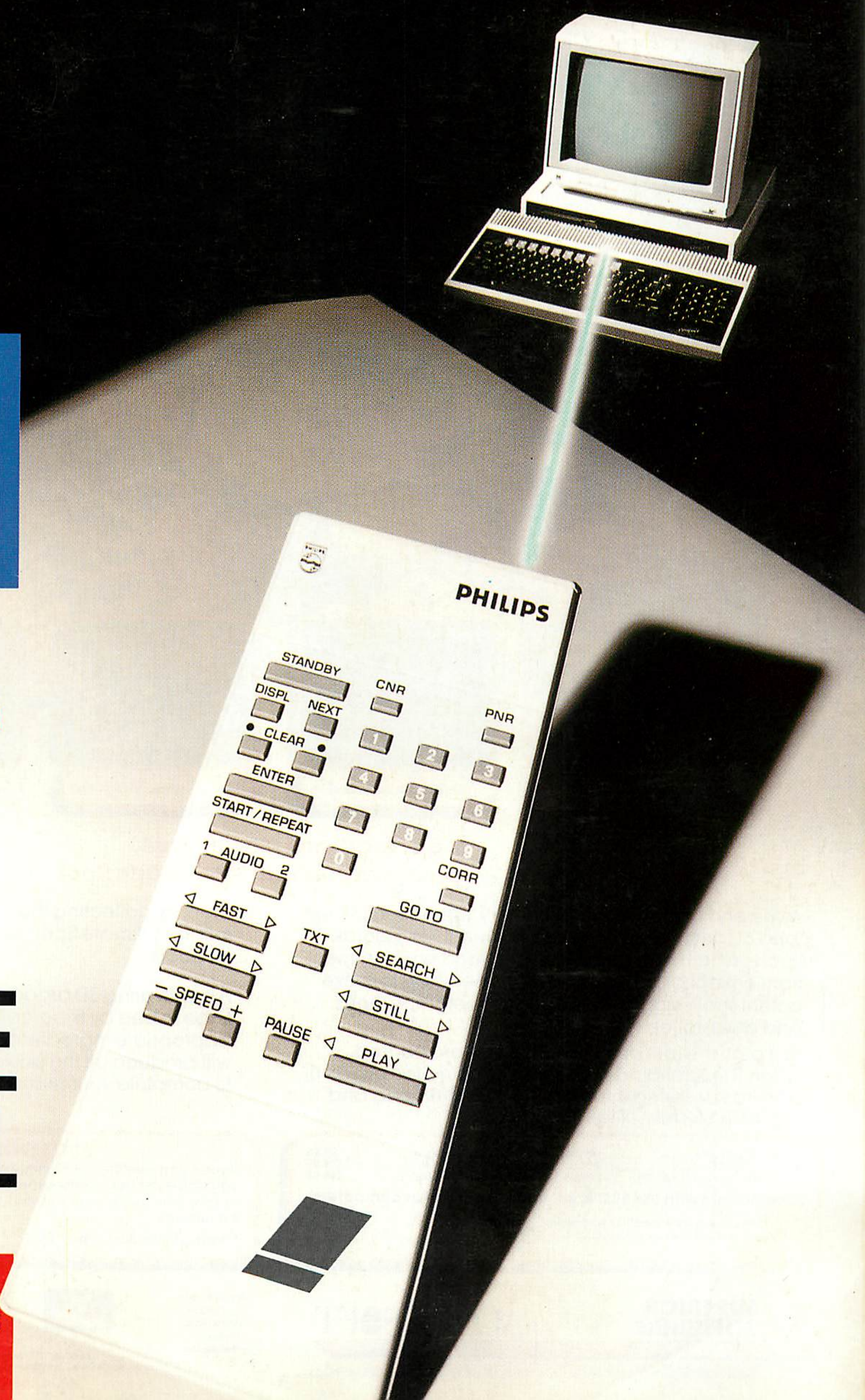
WIZALON:



Addictive type-in machine code game

DESIGN EXCELLENCE:
BBC Soft links radio and TV

MICROBRUSH:
The best yet in graphics?



REMOTE CONTROL

£2500 IN PRIZES:
3 great competitions open to all



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A DEATHMONK APPROACHES

ANOTHER NASTY CONFRONTATION

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Mix with Ashes and Nightshade Root.

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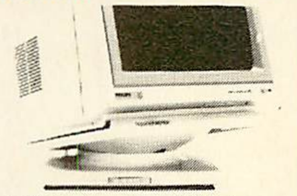
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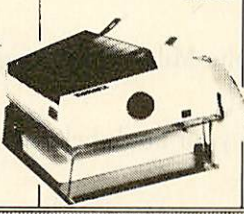
A4 adjustable desk clamping. Magnifying cursor line.
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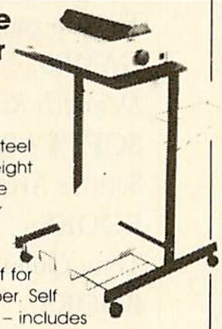
Printer Stand

5mm perspex

80 Column Version
400 x 310 x 100mm
21.65
132 Column Version
600 x 310 x 100mm
29.30



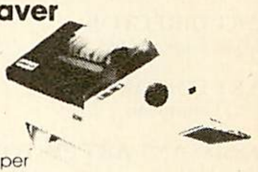
Mobile Printer Stand



Rugged steel frame. Height adjustable basket for output paper & base shelf for input paper. Self assembly – includes castors.

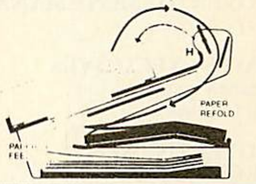
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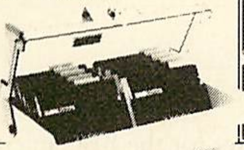
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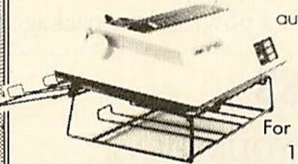
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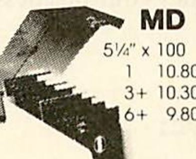
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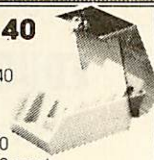
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MD 100



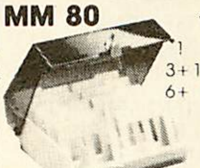
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ACORN USER

ISSUE No 66 JANUARY 1988

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FEATURES

COVER



Photograph by Allan Grainger

NEXT MONTH

Printer Special: Dot-matrix and laser machines reviewed. Plus: Program with style, Transfer files to the Arc, Education goes west and Joe changes channel

 ISSN 0263 7456.

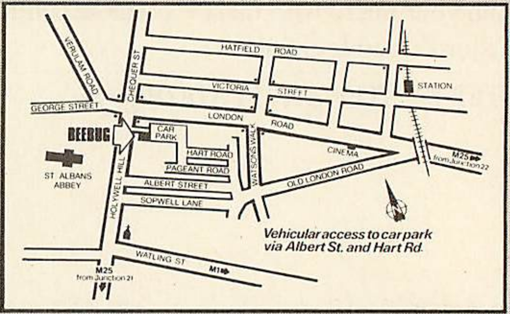
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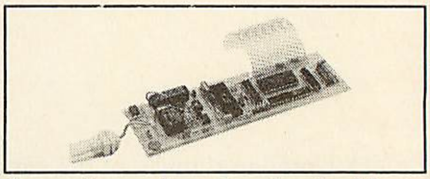
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NEWS

TV schedules ignore micros

By Melanie Adams

The New Year's television schedules contain no joy for computer enthusiasts. The BBC and Channel 4 admitted that there were no new series to follow such programmes as



One of ITV's Telebugs

Micro Live. All ITV has to offer is *Telebugs*, a cartoon series featuring four computer characters with human feelings.

Viewers can now buy last year's Channel 4 series *So We Bought a Computer* on video. It costs £49.93, with a special schools price of £29.95. A viewers' guide with advice for beginners is also available for £1 from the Yorkshire Television Community Education Unit in Leeds.

Superior accuse Gremlin of piracy

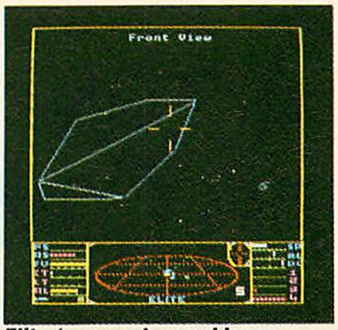
By Steve Mansfield

Superior Software is accusing the author of a Gremlin Graphics game of ripping off the best-selling *Elite*.

According to Superior's managing director, Richard Hanson, Gremlin's *Star Clash* has an 'uncanny' resemblance to the classic game by Ian Bell and David Braben.

He brought the matter to the attention of Gremlin's boss, Ian Stewart, who immediately withdrew it from sale. The game had been selling for about 10 weeks at a price of £4.99, but Stewart was unwilling to say how many had been sold:

The author of *Star Clash*, Julian Bushell, first offered the game to Superior, but it was turned down on the grounds that it was too similar to *Elite*. It lacks the trading element of Superior's game, concentrating instead on galactic dogfighting,



***Elite*: 'uncanny' resemblance**

but the graphics are very similar indeed.

According to Hanson, *Star Clash* has the same appearance as *Elite* – down the the 3-D radar map. The design of the spaceships is different, he said, but they use the same wire-frame graphics. Hanson even suggested that *Star Clash* contains whole sections of *Elite* machine code.

A statement put out by Superior claimed that: 'There is even a slight bug in the *Star Clash* program which is evident in *Elite*. Indeed, many of the machine code routines appear to have been copied verbatim from *Elite*.'

Both companies are having trouble getting in touch with Bushell, who has just gone off to college. Stewart said he is 'waiting to get the programmer up to Gremlin to grill him, to raise the points made by Superior' before making a final decision on whether to drop the game from its catalogue.

■ Richard Hanson confirmed that Ian Bell and David Braben are still working on a follow-up to *Elite*. It has actually been underway since the launch of *Elite*. Hanson said it was taking so long because the authors wanted to be as innovative as the original. That means it will be a totally new game, not a sequel, and so is unlikely to be called *Elite 2*.

Music tutor wins schools design prize

The traditional methods of learning to read music involve significant amounts of brow-beating and parrot-fashion repetition. Nicole Ballantyne decided to change that using a BBC micro and some oversized notes, and her idea won her a major prize in a Design Council competition.

Nicole, from the King Edward VII School in Sheffield, was one of four winners in the 14 to 16-year old section of the Schools Design Prize. She won £200, with another £200 going to the school.

Her invention is a giant music stave into which pupils plug wooden notes to form a tune. If they get the tune correct it's played on the computer attached to the board.

The system works using small switches behind the holes in the stave, which are connected to the BBC micro. The whole thing was developed with the help of a local primary school in Sheffield.



Nicole Ballantyne with her prize-winning machine

Security hints from famous ex-hacker

Having helped start the craze for hacking, Hugo Cornwall is now giving advice on how to avoid having your invaluable data stolen.

In his latest book, *Datatheft*, the author of *The Hacker's Handbook* has turned his attention to the business and industrial community where data security needs to be tight, and all too often isn't.

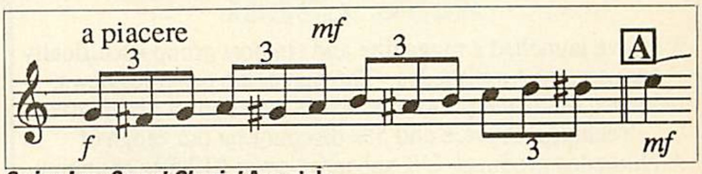
The most successful pseudonym in the business points out that most breaches of security are not through hacking or sophisticated industrial espionage, but simply a matter of wandering around an office picking up discs.

The book is published by Heinemann, and is available in hardback at £14.95.

Arc music manuscript

By Steve Mansfield.

While many people are still wondering if they can afford an Archimedes, Philip Hazel of Cambridge University is actually using an Arc – to print music manuscripts.



***Swing Low Sweet Chariot* Arc-style**

This is a tricky job, as music uses unusual symbols arranged over the page. Stave editors are available for many micros, but they're limited, not least in the amount of music they can handle – which is why manuscripts are usually done laboriously by hand.

Cambridge students, however, can make use of Hazel's system which produces high quality printout from music which is entered in a special text format. The software obviously needs processing power and memory. 'The last time I looked, the program was over 130k long,' Hazel said.

The original program was written in BCPL on the 3216 second processor. Recompiling on the Arc was 'no problem,' according to Hazel. 'It's one of the few things Acorn got right.'

As the whole point is to produce high quality output, Hazel uses a laser printer, the Apple LaserWriter, for the hard copy. However, any printer which uses the Postscript page description language should work with the software.

Using Postscript made life a lot easier for Hazel. Musical notation is full of little lines and squiggles which would be tedious, if not impossible, to do on a dot matrix printer. Postscript, however, has all the primitives built in to handle these kind of shapes.

Hazel has no plans to market the software commercially just yet. But a professional musician is interested in the system for publishing editions. Meanwhile, Cambridge students can continue to have the best looking manuscripts around.

More modems

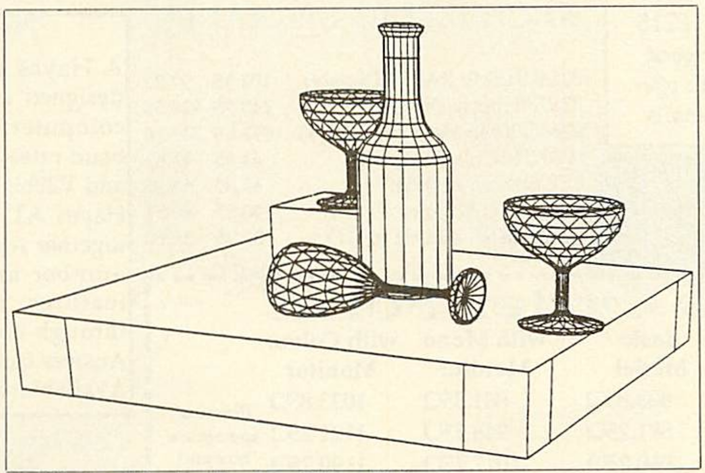
Two new modems have appeared at opposite ends of the market. Dataphone has gone for the home user with the Demon 2, which will sell for around £80, while Dacom is trying to attract bigger spenders with its high-speed 2424 MNP model, at £570.

The Demon 2 handles the most common speeds of 300/300 and 1200/75 baud, and has both auto-dial and auto-answer. Software is available to make full use of these, and costs £19.95.

The more sophisticated Dacom model works at 1200 and 2400 baud full duplex. That means that you can make full use of the high speed lines which are becoming available on services like Telecom Gold.

The 2424 MNP modem also has sophisticated error correction features, which may interest companies who want to transfer data between offices at high speed.

Silicon's solid graphics


Real time solid animation from Silicon Vision

Silicon Vision has improved its *Real Time Graphics System (RTGS)*. The new version is called the *Realtime Solids Modeller* and, as its name suggests, you can now build and animate pictures of solid objects, instead of having the wire frame graphics of the *RTGS*.

The software boasts colour – including dumps to colour printers – and full hidden line removal. It comes on a 32k ROM and six discs, providing 52 new star commands. Second processor and mouse versions of the software are available.

Owners of the existing *RTGS* software can upgrade for £39.95, otherwise the package will cost you £89.95. The original *RTGS* is still available, and the price was recently dropped to £49.95.

News in brief

■ If you're baffled by the Data Protection Act, which came into effect on November 11, you can get the Registrar to answer your problems in person at the *Which Computer?* Show (National Exhibition Centre, Birmingham, 19-22 January 1988).

■ Panasonic has just brought out its first 24-pin dot matrix printer, the KX-P1540.

One of the printer's more unusual features is that you can feed in sheet paper while



tractor-fed continuous stationery is still in the machine. Font cartridges are available, and a 13.5k buffer is fitted as standard. The printer costs £665. Details from Panasonic on (0753) 73181.

Get knitted



Computer knitting at Bodelwyddan TVEI Centre, Powys

The average person's idea of a robot is a laser-firing engine of death, or a depressed, clanking humanoid – certainly not something that sits around quietly knitting jumpers.

Nigel Thompson, who rejoices in the title of senior tutor of robotics at Bodelwyddan TVEI Centre, is aiming to change those preconceptions with a BBC micro connected to a knitting machine.

He has worked with local firms and textile teachers to produce a system which allows students to design knitwear on a micro and then have the machine produce the garment. The student need not know a great deal about computers.

A variety of existing art packages can be used at the design stage – which can happen away from the machine. This means that the designing is not tied to one particular department, subject area or even location. The designs can even be transmitted to the knitting machine by modem. Information about the system can be obtained from the Bodelwyddan TVEI Centre.

Fire brigades teach safety with micros

The BBC micro is to play a key role in teaching schoolchildren the need for fire safety.

Fire brigades all over Britain are being issued with software which will be used to explain what action should be taken in the event of a blaze.

Called *Project Vesta*, the interactive program simulates a house fire in which the user has both to escape and lead others to safety.

At each stage of the fire, pupils are presented with a set of options. Make the right choice and the user survives to the next challenge. Make a mistake and the consequences are spelt out. . .

Project Vesta was launched as part of the Fire Safety Week, an event organised jointly by the Home Office and the Department of Education.

Education minister Angela Rumbold said it was hoped that pupils in safety-conscious schools would grow to become safety-conscious adults.

THE COMMS COLUMN

■ It looks like the London firm Synchrotech will be the winners in the race to get the first Archimedes communications terminal on to the market. The terminal will be a full-featured viewdata and scrolling system, with support for popular auto-dialling modems such as the Designer Modem, Magic Modem, Apollo and Demon. A Hayes version will follow. The software contains a 300 number store, with service names, baud rates, and so on.

Michael Spalter of Synchrotech told me that after showing the software at the November *Micro User* show, he will be releasing the final version before Christmas. Sources tell me that the other contenders in the Archimedes terminal market aren't quite as near as this.

Interestingly, Michael says that unlike many others, he has found no problem with the RS423 interface on the Archimedes, and is quite willing to talk to people having problems through his Prestel mailbox: 011111860.

■ Regular comms watchers will know about the recent massive increase in Telecom Gold charges, and the bad feeling it has caused. Microlink, the Database Publications user group on Gold, has, for the last few months, delayed the introduction of these charges, but the issue was unresolved. Microlink recently issued a statement concerning a £1.3 million pound deal with Gold, whereby it moves on to a new Gold mainframe. This doesn't make much difference to the average user, but reading between the lines it looks like the old (ie, cheap) charging system is now going to remain intact.

It seems that Database has managed to persuade Gold not to increase the charges for its customers, so why no fanfare of publicity over the fact that Microlink is the cheapest way of using Gold?

A source close to the company tells me that part of the agreement with Gold is that Database doesn't make a song and dance about it, and upset all the big corporate customers who subscribe to Gold via British Telecom, and are of course paying the higher charges.

■ Matmos has announced a price cut to an amazing £169 for its Plessey T24 BABT-approved auto-dial auto-answer modem. With even the keenest-priced competitors like the Tandata TM722 and Pace Series 4 modem only a shade under £500, this seems like incredible value for money. The modem isn't Hayes compatible, but is driveable from most BBC software packages. Matmos is on (0444) 414484.

■ **Bulletin board spotlight** Falling under our critical eye this month is the Dudley College of Technology database, run for the last couple of years by college staff member David King.

The DCT viewdata board is rapidly gaining a reputation as the source of material for owners of the Music 500/4000 and 5000 synthesisers. Much of the database is devoted to Ample with a regularly updated message section, hints, tips, tutorials, lists of other boards with Ample sections and most interesting of all, a large collection of downloadable Ample telesoftware.

Also for BBC users, there is general telesoftware and a collection of Econet utilities. A lively message section is maintained. The board is on Dudley (0384) 239944.

David Atherton


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More releases swell software catalogue

By Steve Mansfield

The flow of software for the Archimedes is starting to increase, although much of it consists of packages converted from the BBC micro.

It's possible that some software producers have been waiting for the release version of Arthur, the Arc's operating system. Early machines had version 0.2, while most of the machines shipped recently had version 0.3.

Acorn is offering to lend version 1.2 to software houses so that they can test their products before launching. However, Arc 440 machines have already been spotted running version 1.1, along with warnings about disc corruption. One company we know of was told that attempts to back-up the hard disc on to floppies could result in the floppies being corrupted.



The Arc: building up a respectable software list

■ Contex Computing has released several titles for the Arc. The packages include *Bank Manager Master* at £25, *Typing Tutor* at £15, *Business Utilities* for £12 and *Easy Reader* and *Madlibs* at £12.50 each.

■ Dixon and Dixon, a firm of farm management consultants, has adapted its farming accountancy packages, the first being *Farmcash*. This covers book keeping, VAT on invoicing, budgets and stock control. Further titles will include *Farmplanner* and *Fieldfile*. *Farmcash* costs £230.

■ Raycomp has brought out an £8.50 spreadsheet. Known as the *RC-Spreadsheet*, the software needs a lot of memory and so is being aimed at the Arc market, although it will work on other BBC micro models with second processors or shadow memory.

As well as being able to swap data files between the different machines, they can also be used with the database.

■ Philip Hazel, is selling a booklet of all the Arc's machine code calls, including star commands and Osbyte calls. The booklet costs £1.10.

Competition hots up for Unix on RISC

There have been interesting developments on the Unix and Olivetti front. It is widely believed that Olivetti originally became interested in Acorn because of RISC technology. Apart from owning 79 per cent of Acorn, Olivetti is in turn part owned by AT&T, the company which holds the rights to Unix.

The Acorn RISC system is a logical machine to run Unix – it has the memory capacity and processing power – and Acorn is developing a Unix compatible operating system for it. What's more, Acorn is keen for people to buy the chip to use in their own hardware packages.

Acorn has referred to 'an exciting. . .new series of Unix workstations' in a press release.

However, A&T has signed an agreement with Sun, a well-known company in the professional graphics workstation market. Sun has developed its own RISC chip, and AT&T has chosen this 'Sparc' chip to use in a future Unix workstation. The two companies have also agreed to ensure their future versions of Unix are compatible. Xerox has also fallen into line with a similar undertaking. It remains to be seen how this will affect Acorn.

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Acorn User is proud to announce another service to readers. We are now able to transfer the contents of unprotected DFS or ADFS 5.25-inch discs on to 3.5-inch ADFS discs. The cost is £5, or just £3 if you send us a blank ADFS formatted 3.5-inch disc.

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Two great competitions for you to enter

There's an Archimedes and £750-worth of software at stake in the Great Newspaper Competition, run by *Acorn User* and AMS.

All you have to do is plan and create two pages of your own tabloid-sized national newspaper using a BBC micro. It will be run in three separate age groups, and editorial quality will be as important as layout and design when it comes to the judging.

Details of the competition were in the November 1987 issue of *Acorn User.*

For current Archimedes owners, there's the *Artisan* contest. Clares and *Acorn User* are offering a box of discs to the person who draws the best picture each month, using Clares' *Artisan.* The best picture overall will be turned into a real painting by Jon Warmisham, Clares' artist-in-residence. Details were published in the December issue. And we will publish the winning pictures.

If you don't have the back-issues, then for details of either competition, send an SAE to *Acorn User,* 20-26 Brunswick Place, London N1 6DJ.

December Blunderbox

Sometimes we get a bit ahead of ourselves. In the last issue we printed a correction for listings in the same issue. Naturally this has confused some people who normally look for corrections a month or two later.

The mistakes were in Joe Telford's PACK and UNPACK programs. Two lines for the PACK program (Joe's Jottings listing 2) should read:

```
1160 FOR I%=&900 TO &9B9
1190 IF P%<>23135 THEN P
RINT "Check listing":END
```

Similarly, there are two incorrect lines in the UNPACK listing. They should read:

```
980 FOR I%=&900 TO &99B
1010 IF P%<>18459 THEN P
RINT "Check listing":END
```

We apologise for any confusion. In future we shall attempt to publish the corrections *before* the magazine appears!

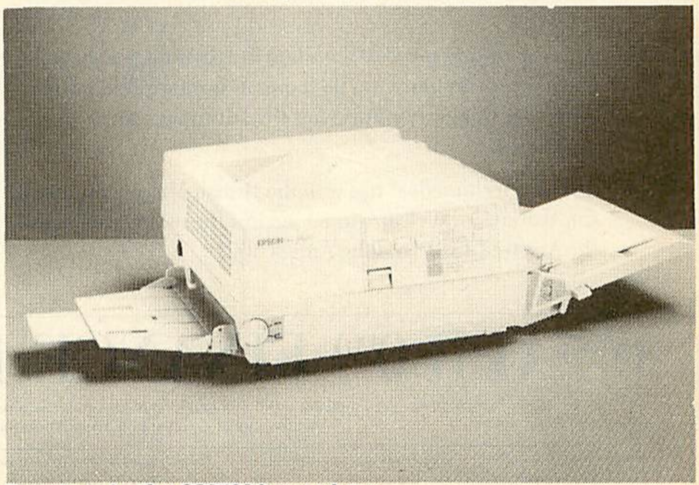
Contacts list

Acorn, Cambridge Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411.
Acorn User, 20-26 Brunswick Place, London N1 6DJ. Tel: 01-490 1441.
Clares Micro Supplies, 98 Middlewich Road, Northwich, Cheshire CW9 7DA. Tel: (0606) 48511.
Computer and Technical Services, 4 Church Walk, Eggington, Bedfordshire LU7 9QL. Tel: (052521) 0706.
Computer Park, 25 Bridge Street, Rotherwell, Kettering, Northamptonshire NN14 2JW.
Contex Computing, 15 Woodlands Close, Bedford MK44 3UE. Tel: (02303) 347.
Dacom Systems, 26-27 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR. Tel: (0908) 322322.
Dataphone, 22 Alfric Square, Woodston, Peterborough PE2 0JP. Tel: (0733) 230240
Design Council, 28 Haymarket, London SW1Y 4SU. Tel: 01-839 8000.
Dixon and Dixon, 35 Rokeby Drive, Kenton, Newcastle upon Tyne NE3 4JY. Tel: 091-285 3042.
Philip Hazel, 33 Metcalfe Road, Cambridge CB4 2DB.
Heinemann Professional Publishing, 22 Bedford Square, London WC1B 3HH. Tel: 01-637 3311.
Institute for Social Inventions, 24 Abercorn Place, London N8 9XP. Tel: 01-229 7253.
Yorkshire Television, Television Centre, Leeds L53 1JS.
Raycomp, 46 French Avenue, Dunstable, Beds LU6 1BH.
Silicon Vision, 47 Dudley Gardens, Harrow, Middlesex HA2 0DQ. Tel: 01-422 2274.
Triangle TV, 130 Brookwood Road, London SW18 5DD. Tel: 01-874 3418.

Printer special – AU's February issue

Have you been searching in vain for the printer of your dreams? Or are you constantly squabbling with the model you've got? Our February issue tells you what to look for in the perfect printer.

- What type of printer is right for you? David Atherton looks at the latest technological advances, concentrating on 24-pin dot-matrix models and the hi-tech lasers.
- Could the Epson GQ3500 low-cost laser printer and the handsome Qume Laser Ten Plus be the answer to your prayers? We review both machines.
- Will Bruce Smith find happiness with the new Panasonic dot-matrix series? How did Steve Mansfield get on with the Watford Electronics *View* printer driver ROM? *Acorn User* has all the answers.
- Meanwhile Drage and Evans forsake the school house and take the wagon trail west to California in search of historical simulations.
- Joe Telford prevents squabling at home by timetabling TV viewing with a type-in program.
- If your Beeb and Arc won't talk to each other, our file transfer program will help them reconcile their differences.
- Our regular reviews include a look at *Artisan,* the Archimedes graphics package from Clares. There will be all the latest Acorn news too – will the company find a new man to take it in hand? Plus games galore, the Comms Column and so much more!



Epson's seductive GQ3500 laser printer

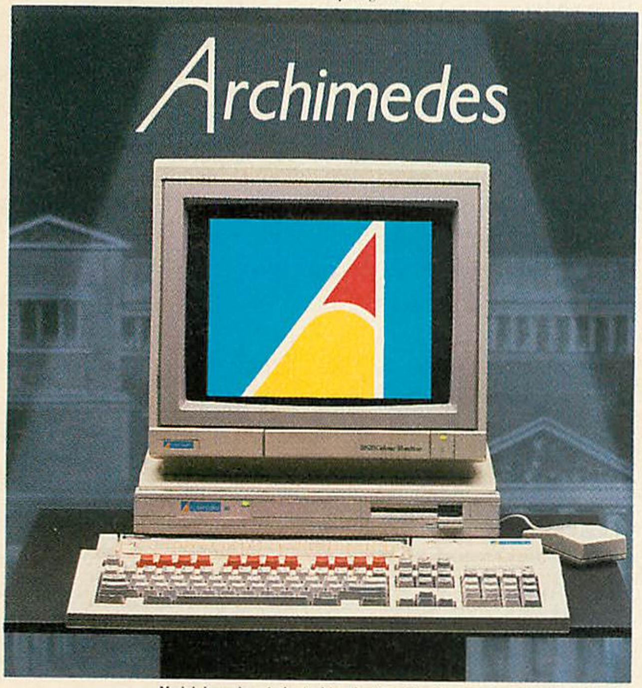
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Model shown here is the Archimedes 310 with colour monitor and includes Mouse.

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- In addition to BBC Basic V, high level languages such as 'C' and 'Pascal' can be used for specialist applications fully exploiting the computer's outstanding power, graphics and speed.
- The huge potential of Archimedes doesn't stop there. The 310M with its built-in PC emulator can run Lotus 1.2.3,* D BASE III,* MS-WORD,* and other popular business programs available under MS-DOS.*
- With prices starting at £749 exc. VAT for the 305 with mono monitor and rising to £1035 exc. VAT for the 310M with colour monitor, the Archimedes 300 series represents unparalleled value for a computer system of such capability.

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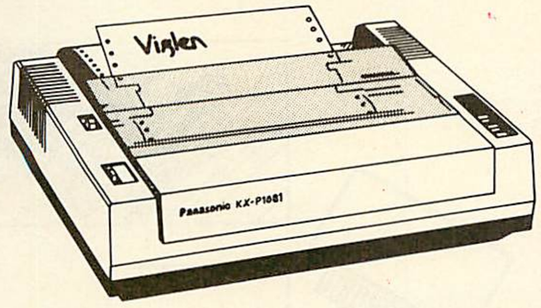
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Written quotation available on request from participating dealers who are licenced credit brokers.

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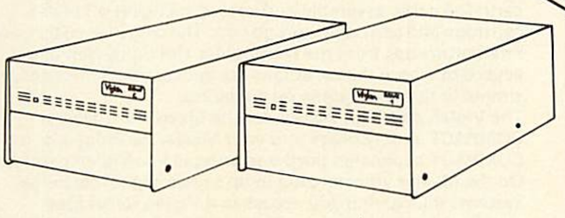
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The Viglen Winchester is ready to plug in and use on a BBC Master micro; for a BBC B or B plus you will merely need to fit the Acorn ADFS Rom. The Winchesters are 100% compatible with the Acorn Winchester and Acorn ADFS and will also work with the Acorn Master 512 board with DOS plus.
Drive 1 Winchesters are also available for backup or just more storage and simply plug into the back of the Drive 0 unit.
The Winchester package consists of: Winchester unit (cased with controller boards, power supply and fan), Master reference Manual part 1, Winchester user guide and Winchester utilities on disk (such as formatter, verifier, ADFS menu and sophisticated backup program allowing you to make fast backups on DFS disks, ADFS disks or Drive 1 Winchester).

Stock Code	Description	Price inc. VAT
Drive 0 Single		
V150	VB20 20Meg Viglen Winchester	£569.00
V152	VB28 28Meg Viglen Winchester	£599.00
V155	VB40 40Meg Viglen Winchester	£799.00
V156	VB56 56Meg Viglen Winchester	£899.00
Drive 1 Second Drive		
V160	VB120 20Meg Drive 1 Winchester	£499.00
V162	VB128 28Meg Drive 1 Winchester	£529.00
V165	VB140 40Meg Drive 1 Winchester	£739.00
V167	VB156 56Meg Drive 1 Winchester	£769.00
V157	20MB Tape Streamer Backup	£689.00
V503	Acorn ADFS Rom and Manual (Only necessary for BBC B or B Plus)	£29.95

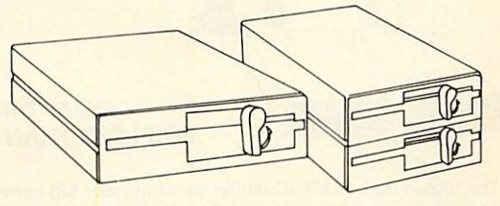
Please add £8 for insured courier delivery.

Available for use with SJ research file server at no extra cost, please specify when ordering.

DISK DRIVES

FROM £99.95 inc. VAT

The finest Japanese disk drives (not Taiwanese immitations) available at the lowest prices.

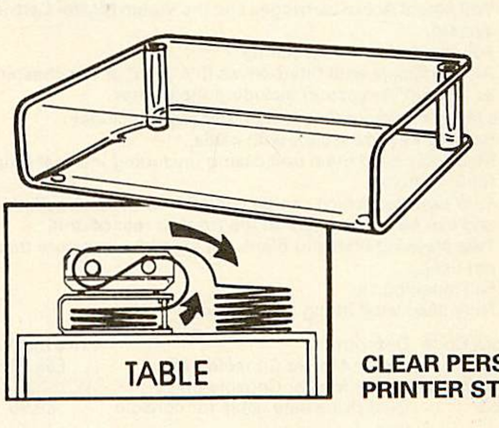


All disc drives are supplied with a manual, packed utilities disc and a full 12 Months warranty (2 Year Warranty available) and are ready to plug in and use on a BBc B (fitted with a DFS) B + or Master micro. 40/48 Track drives have a switch which enables operation in either 40 or 80 track mode.
The capacity quoted are given in single density mode; for double density mode (1770 DFS + ADFS as in the Master) the capacities should be approximately doubled.
An integral power supply is not necessary as the disc drives run from the micro's power source however should you require drives with their own power supply, these are also available.
If your BBC B micro does not have a DFS fitted then you will also require the Acorn dfs kit. These are available from Viglen.

Stock Code	Description	Price inc. VAT
SP014	400K Single Drive 40/80T	£99.95
SP030	400K Single Drive 40/80T + PSU	£109.95
SP019	800K Dual Drive 40/80T	£189.95
SP020	800K Dual Drive 40/80T + PSU	£209.95
VPD0240	100K Single Drive	£105.95
VPD0241	400K Single Drive 40/80T	£113.00
VPD0242	200K Dual Drive	£195.95
VPD0243	800K Dual Drive 40/80T	£219.00
VPD0245	100K Single Drive + PSU	£119.95
VPD0246	400K Single Drive + PSU	£135.00
VPD0247	200K Dual Drive + PSU	£209.95
VPD0248	800K Dual Drive 40/80T + PSU	£235.00
VPD0249	800K Dual Drive 40/80T + PSU in Metal Bridge Unit	£265.00
V0060	3.5″ 400K Single Drive	£95.95
V0061	3.5″ 800K Dual Drive	£199.95
V0062	3.5″ 400K Single Drive + PSU	£135.00
V0063	3.5″ 800K Dual Drive + PSU	£199.00
V0065	3.5″ and 5.25″ 800K Dual Drive	£219.00
V0064	3.5″ and 5.25″ 800K Dual Drive with PSU	£249.00

Please add £8.00 for insured courier delivery.

PRINTER STANDS



CLEAR PERSPEX PRINTER STAND

The Viglen printer stands are beautifully finished in clear perspex and raise the printer high enough to put continuous stationary underneath.

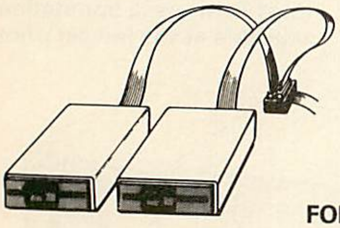
Stock Code	Description	Price inc. VAT
V490	80 Column Printer Stand (15″ × 13″ × 3.5″)	£19.95
V491	136 Column Printer Stand (23.5″ × 13″ × 3.5″)	£29.95

Please add £3 P & P

ORDER FORM ON LAST PAGE OF VIGLEN SECTION

SPECIAL CHRISTMAS OFFERS FROM VIGLEN

DUCKS



DUAL DRIVES FOR LESS THAN £17!

The Viglen Data DUCK (Dualling Up Connector Kit) converts any two single drives to a dual drive instantly. Simply plug the duck into the micro's disk drive socket and plug two single drives (any type and any make) into the duck to obtain a dual drive system accessed as drive 0 (and 2 if double sided) and drive 1 (and 3 if double sided). If neither single drive has its own power supply then you will require a Viglen power DUCK in order to obtain two disk drive power sockets from the micro.

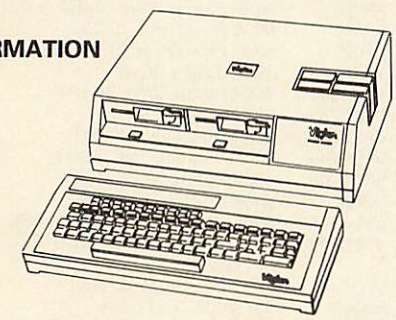
★ No soldering simply plugs in.
★ No need to take disk drives apart to change links.

Stock Code	Description	Price inc. VAT
V084	Viglen data duck	£16.95
V085	Viglen power duck	£7.95

Please add £2.50 for P & P.

CONSOLE SYSTEM

MASTER TRANSFORMATION



Give your BBC Master micro the professional PC look by replacing your existing lid with this smartly styled package. The system is strong and constructed in high impact ABS colour matched to the BBC Master and it gives your Master a very neat and impressive look.

★ Will support monitors including up to 16" TV.
★ Can house two 5¼" disk or Winchester drives.
★ Capable of housing 3½" drives.
★ Will accept Acorn cartridges and the Viglen Master Cartridge system.
★ Full internal metal screening.
★ Also available with fitted drives (5¼", 3½" or Winchester) or as a complete system including the Master.

The Master console unit system packages includes:

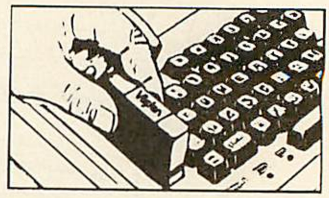
★ Remote Keyboard case with cable.
★ Metal screened main unit casing (including internal fittings for 5¼" drives).
★ Two switches which can be used for 40/80 track switching and can be either fitted on the front or rear of unit.
★ Two blanking plates to blank out any drive aperture that is not used.
★ Full labelling kit.
★ Fully illustrated fitting instructions.

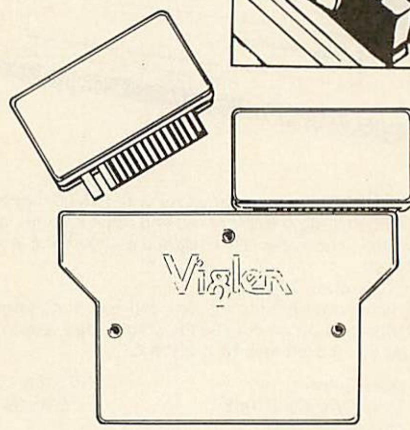
Stock Code	Description	Price inc. VAT
V861	Viglen Master Console unit	£59.95
Accessories for the Master Console unit		
V853	Dual Drive data cable for console unit	£9.95
V854	Dual Drive power cable for console unit	£7.95
V855	Power supply for the console unit	£34.95
V866	Fan Kit for console unit	£34.95
V858	Fitting bracket for 3½" drive	£8.95
V851	Viglen Professional Console Unit for the BBC micro	£49.95
	Fitting service available from	£15.00

Please add £8 for insured courier delivery.

CARTRIDGE SYSTEM

VIGLEN ROM CARTRIDGE SYSTEM





Having fitted the Viglen Rom cartridge system to your BBC, Master or Master COMPACT, you can plug in your Roms/Eproms simply by inserting each one in a Viglen cartridge and plugging in whichever cartridge you want to use. The same Viglen cartridge can be used on all the micros mentioned and there is no need to switch the micro on and off between cartridge changes.

The Viglen cartridge system for the BBC micro consists of the cartridge cable assembly and socket, blanking off plates, 1 cartridge and cartridge storage rack. The cartridge socket when fitted protrudes from the rectangular slot on the left of the keyboard where the cartridges are subsequently inserted. It is simple to fit and requires no soldering.

The Viglen cartridge system for the Master and Master COMPACT simply plugs into your Master cartridge slot (or COMPACT expansion port) and accepts two Viglen cartridges. On the Master you can plug in up to two Viglen cartridge systems thus giving you access to 4 Viglen Cartridges simultaneously. The system comes complete with 2 cartridges and cartridge storage rack. On the Master you can also use Viglen cartridges which have 32 and 64K paged Roms inserted.

Stock Code	Description	Price inc. VAT
V560	Viglen Rom cartridge system for BBC	£12.95
V559	Viglen Rom cartridge system for BBC (low profile)	£12.95
V550	Viglen Rom cartridge system for Master	£14.95
V551	Viglen Rom cartridge system for COMPACT	£14.95
V561	Single Viglen cartridge	£3.45

Please add £2.50 P & P (£00.50 for single cartridge).

Viglen wishes a Merry Christmas and a prosperous New Year to all our customers.

ORDER FORM ON LAST PAGE OF VIGLEN SECTION

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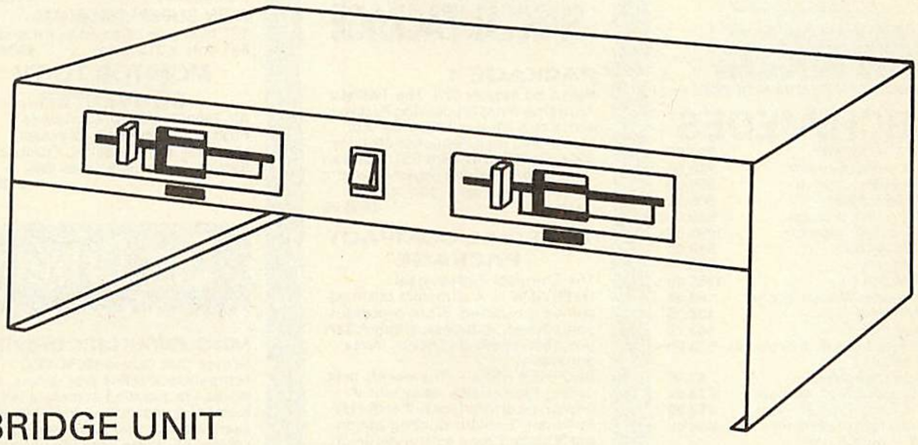
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XMAS OFFER £229.95 Inc. VAT

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Hanwell, London W7 2QA
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SALES HOTLINE
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Universal second processor	£86.25
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Filestore provides shared access to file and printer services on Econet. The filestore consists of two units – a dual 3.5 inch floppy disc unit 1.2 Mbytes of storage (Filestore EO1) which can be expanded with a high performance 20 Mbyte Winchester disk drive unit(Filestore E20).

FILESTORE EO1	£952.00
FILESTORE E20	£829.00

ECONET ACCESSORIES

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Econet Starter Kit	£99.00
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Twillstar continues to offer the MASTER COMPACT for your Home Education and Business needs! Complete with bundled software and an integral 3.5" Disk Drive in the following Systems:-

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ADFS ROM	£29.95
Disc Upgrade Kit	£65.00
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PACKAGE 1

Based on Master 128. The Twillstar All in One Word Processing Package contains a Master 128, View 3.0, Viewsheet, High Res Green Monitor, 800K Dual Drives with PSU, Gakken Daisy Wheel Printer together with a box of Discs, Paper, and all the Cables. £885.00

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Source Disk Drives 100% BBC compatible slimline disc drives. All drives are supplied complete with formatting diskette, comprehensive users manual and all necessary cables. All drives are 40/80 Track switchable at the front and have two years warranty.

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Winchester Disk Drives

WINCHESTER DISK DRIVES

Source HD20 Twillstar's 20 Mbyte winchester drive including Acorn DFS ROM complete with P.S.U. £499.00

Source HDP201 Twillstar's 20 Mbyte winchester drive and a 400k double sided floppy drive built in a plynth to accomodate monitor on the top and the computer underneath. Includes ADFS ROM and P.S.U. £799.00

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Further 64k upgrade available.

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2 – 1	£39.00
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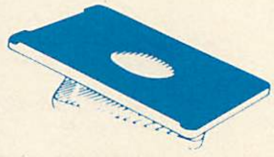
Parallel T switch	£67.85
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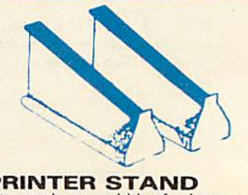
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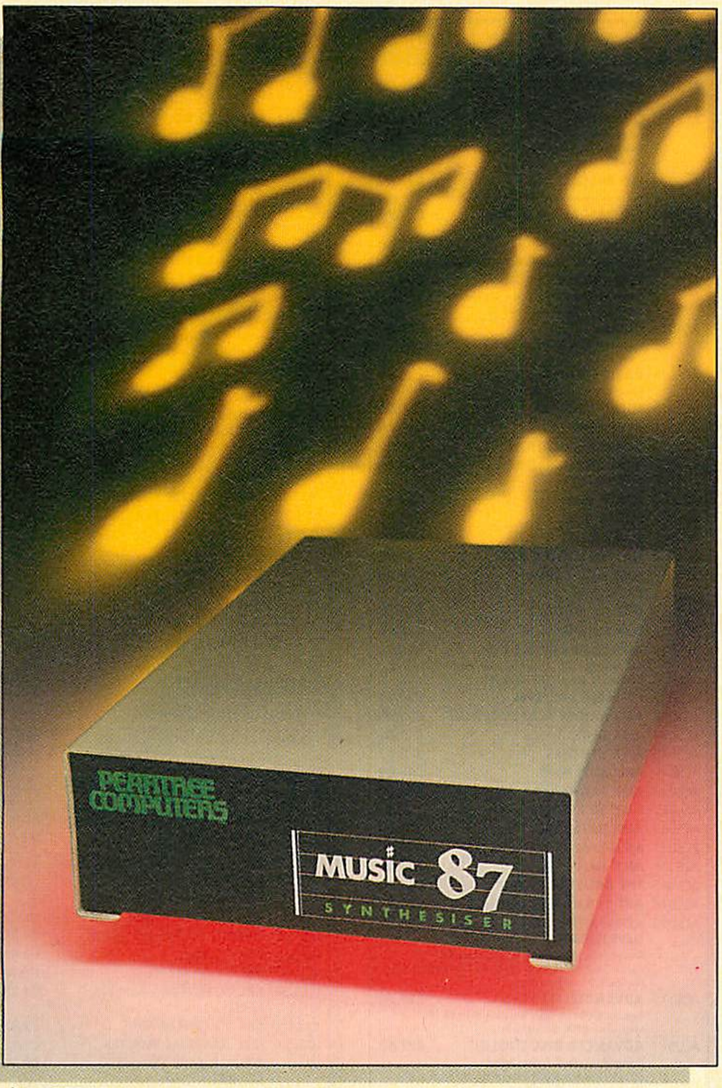
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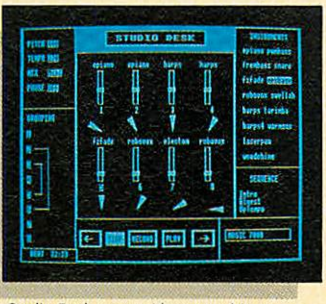
OVER 17000

visitors attended the 87 Acorn User Show. Most were amazed at the performance of the **MUSIC 87**. As a result we have been receiving hundreds of telephone calls from people wanting to know the differences and merits of the **MUSIC 87** synthesiser when compared to more expensive music synthesisers. Below is a table showing how the **MUSIC 87** compares to the Music 5000.*

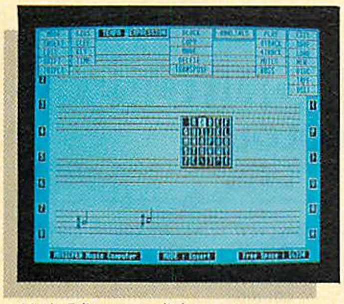
9 good reasons to buy the **MUSIC 87** rather than the Music 5000.*

FUNCTION	Music 5000	MUSIC 87
Mouse driven	✗	✓
2nd processor compatible	✗	✓
Light pen driven	✗	✓
Full 32k EPROM	✗	✓
Waveform designer as standard	✗	✓
Ability to bypass AMPLE	✗	✓
Graphic representation of waveforms, envelopes and score	✗	✓
Music printout as standard	✗	✓
Expensive	✓	✗

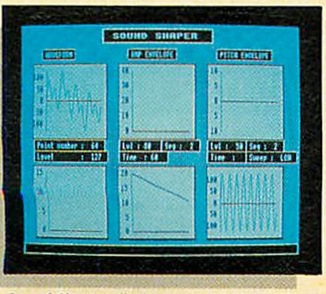
Price	Music 5000.*	**MUSIC 87**
	£161.00	**£79.95**



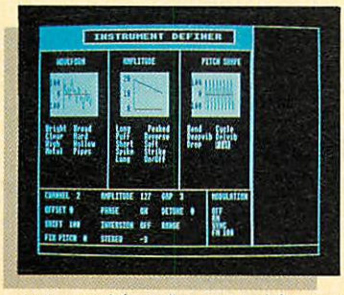
Studio Desk menu with mouse driven record, play, rewind options



Music Editor menu, light pen & mouse driven with complete menu options at top



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Instrument definer allows you to define your own instrument pitch, amplitude and wave forms

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*Music 5000 is supplied by Hybrid Technology Limited

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BRITISH BROADCASTING CORPORATION MASTER SERIES MICROCOMPUTER

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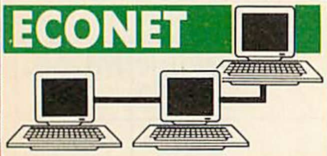
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ACH004	**BBC MASTER COMPACT MONO** As above with high resolution green monitor	£445.00
ACH005	**BBC MASTER COMPACT COLOUR** As above with RGB medium res colour monitor with video composite	£545.00
ACH011	**TURBO UPGRADE for MASTER 128** 65C102 co-processor 4MHz · 64K ram extra high Basic, high editor	£99.00
ACH012	**512K MSDOS for MASTER** IBM compatible DOS plus 8186 processor	£189.00
ACH041	**UNIVERSAL 2nd PROCESSOR** Allows both the turbo upgrade and the 512K upgrade to be run on the BBC Model B or B+	£75.00
ACH015	**1770 DFS KIT for BBC B** Allows BBC to access disc drives Allows you to use ADFS as well	£41.00
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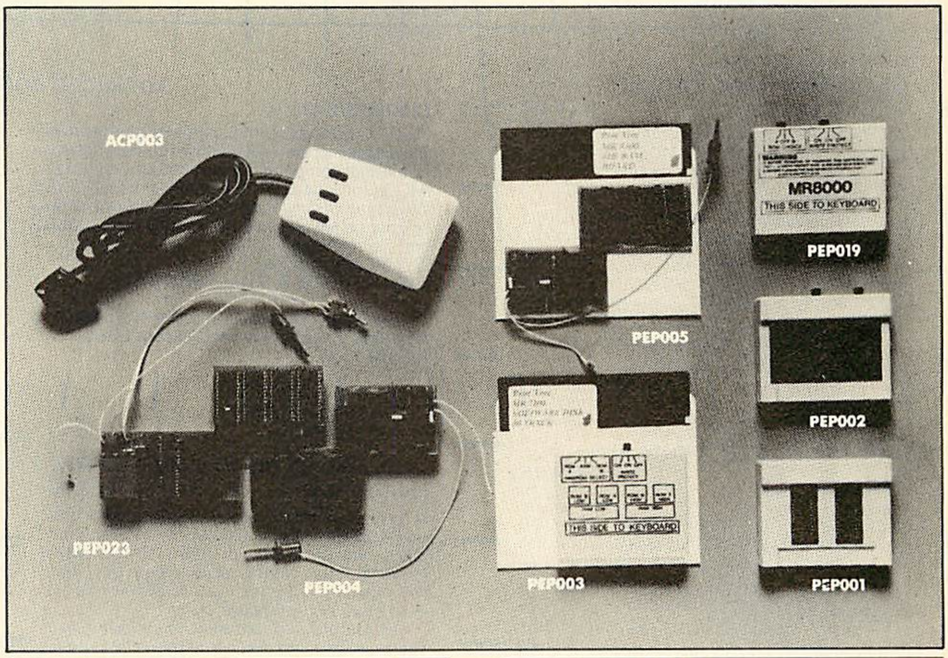
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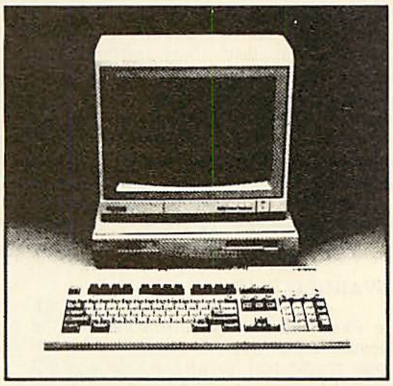
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- **BB BASIC V;**
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- **ECONET plug-in option;**
- **a variety of podules can be fitted.**

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The 300 Series, identified by its red function keys, consists of two models, ARCHIMEDES 305 with 0.5 Mbyte of RAM and ARCHIMEDES 310 with 1 Mbyte of RAM. These machines are the latest generation of British Broadcasting Corporation Micros. They offer, at low cost, all the basic features with expansion capabilities. Both machines have a 512 Kbyte ROM and a 1 Mbyte (unformatted) 3½" disc drive.

THE 400 SERIES

The more powerful 400 Series offers considerably increased expansion capabilities. These machines are the new range of Acorn Computers.

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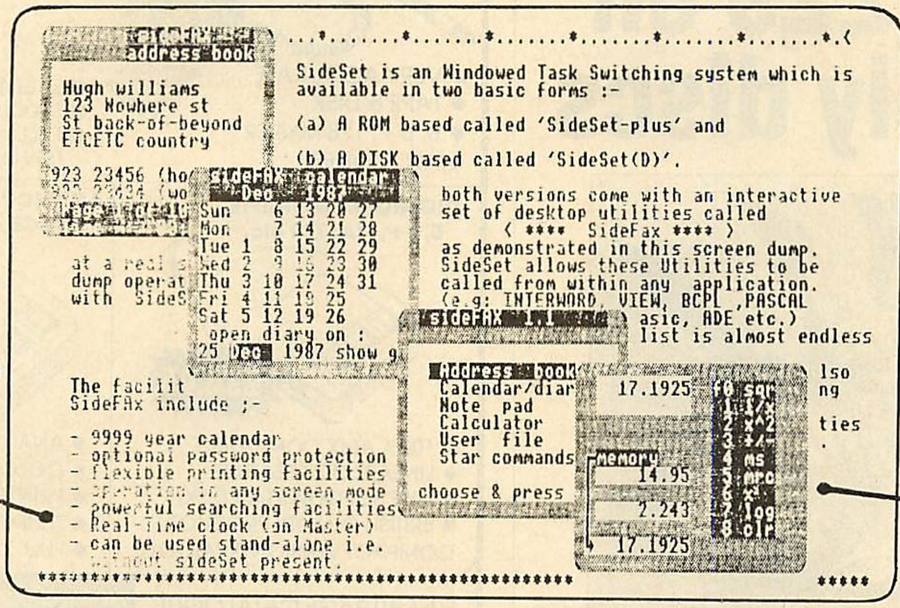
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[SideSet(D) is a Disk based version]

Once installed it allows the user to suspend his current application (task) and pop-up a utility anywhere on the screen. The original application can be restored at any time with a simple keystroke. (ctrl-@,R)

SideSet(D) is compatible with virtually all serious software eg: VIEW,INTER-WORD,PASCAL etc

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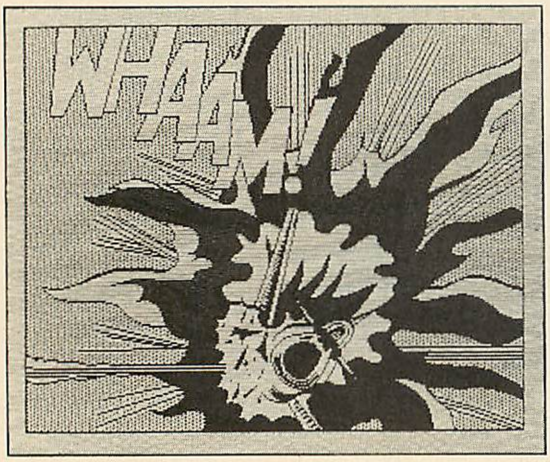
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Sir, I am currently using the Watford wordprocessing disc but find it very limiting. I am looking at buying a word-processing chip for my computer but do not know which system to choose.

The three contenders are obviously *Wordwise, View* and *InterWord*. I have copies of your magazine going back only until January 87 and can find no definitive article on word-processing. Could you therefore please give me a quick run down on the advantages and disadvantages of these systems and give me a clue as to which might suit me best.

I use wordprocessing mainly to write short private and business letters, but I also write some personal legal documents such as tenancy agreements.

Flight Lieutenant Millo
RAF

Any of these wordprocessors will do the job you [illegible]tion. Which you choose depends a lot on personal preference.

***Wordwise* is the easiest to use, but can only show 40 characters per line. *View* can work in any screen mode, but is generally felt to be more difficult to use. *InterWord* has great facilities, but can be awkward in use.**

It's a toss-up, but we prefer *View*, if you can find someone to get you going. It's also the best-supported with books: Clive Williamson's *View, ViewSheet and View-Store*, and Bruce Smith's *View*.

INTERBASE RESPONSE

Sir, Bruce Smith's criticism of *InterBase* in November is undoubtedly in order, but he has failed to acknowledge the virtues of the product.

As a database *InterBase* is primitive and it should be judged only as a programming language and in comparison with *System Delta*. I have no hesitation in ranking it way ahead of this latter product for several reasons.

- As a database language *InterBase*'s commands are better thought out, and the response is more natural than with *System Delta*.
- Bruce criticises the *InterBase* manual, yet it is a model of clarity compared with *Delta*.
- *Delta*'s manipulation of HIMEM leads to various problems, not least virtual restriction to mode 7.

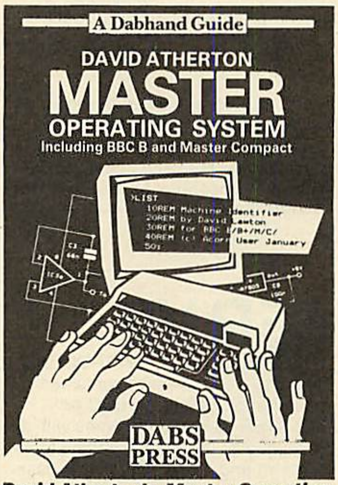
Finally, *InterBase*'s error handling is an improvement on that of Acorn's Basic. It is much more than a database language; it is an enhanced Basic language in its own right with all the advantages of the Basic 5 supplied with the Arc and freedom from the pain of line numbers, because of the use of labels. (There has to be a slight qualification here: debugging is not so easy as the error messages do not give the precise location of the error.)

Computer Concepts should have avoided the name *InterBase* and called its product 'DataBasic'.

David Pears
Upminster

MASTER IN PRINT

Sir, I have been looking for books on the BBC Master 128 around Oxford but have not been able to find any. I am really looking for anything to help me understand my computer's differences from the BBC B which I had previously. I can program quite well in Basic and slightly in assembler and would be very pleased if you could send me details of



David Atherton's *Master Operating System*

any such books and where I could obtain them.

Joel Brown
Oxford

There are few books around specifically for the Master – even Acorn has failed to support buyers with its advanced guide. However, Victory Publishing, Dabs and Adder have tried to fill in the gap. Victory has the *Advanced Sideways RAM User Guide* (£9.95) at PO Box 19, London N11 1DS; Dabs publishes *Master Operating System* by David Atherton (£12.95) at 76 Gardner Rd, Manchester M25 7HU; and Adder has recently updated the *New Advanced User Guide* (£19.95) to cover the Master, at Cambridge Science Park, Milton Road, Cambridge CB4 4GF.

All of these should be available through a good bookshop or the dealers in Oxford: Absolute Sound and Video in Old High Street, and CT Maddison on London Road.

PROBLEM TABLES

Sir, As secretary of a local sports league I keep a list of results in a similar manner to the football league.

This seems a most suitable application for a computer, so I orgainsed a spreadsheet into which I posted match results. But although the matches won, drawn, lost and the points scored are recorded correctly, the teams are not in correct league order. Is there any software available that would suit my needs?

M Hyde
Liverpool

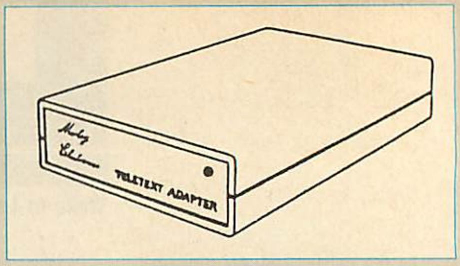
A simple problem, but is there a simple solution? What you want is a spreadsheet for doing the maths, combined with a database for sorting, which isn't easy! The only solution which comes to mind is *View Professional*. This can sort an area depending on the numerical order of a column.

If any readers know a cheaper program (*VP* costs £100), we'd like to hear of it.

TELETEXT ADAPTER

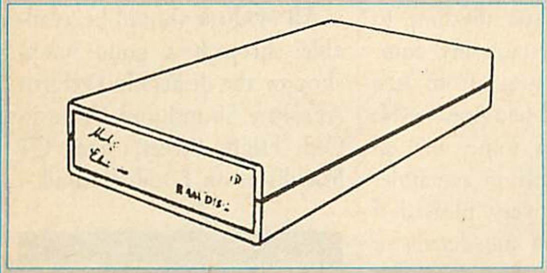
Would you like access to free high quality software and over a thousand pages of information, but Prestel access charges and phone bills too expensive? Then read on!
The answer is Teletext. Yes the same system everyone has seen incorporated into television sets, but with a difference. When Teletext is read by a computer you can actually use the data.
The MORLEY TELETEXT ADAPTER introduces you to the world of Teletext at a price that won't break the bank. Inside it you will find the latest in second generation Teletext chip technology, which unlike our rivals who are still using chips designed more than ten years ago, will be fully compatible with any future advances in the Teletext system.
With the Morley adapter you will get a state of the art unit that automatically tunes itself into the required station (no more messing around with screwdrivers or twiddling little knobs in the back of the case), a user friendly menu driven program, easy to follow instructions and a 12 month warranty. Add to this the free downloadable telesoftware and we are sure that you will agree that we are offering you one of the best bargains on the market today.

FEATURES:
* Advanced design uses the latest technology, will handle ANY future enhancements to the Teletext system e.g.: full field; 8 bit data transfer; 2k pages etc.
* Simply plugs into the user port.
* Low power consumption, less than 200ma. Optional power supply available.
* User friendly menu driven software including extended OSCLI and OSWord commands for access from BASIC programs.
* Supplied with 16k ATS (Advanced Teletext Software) and 16k support ROM software inc. printer dumps, page spoolers etc.
* FREE Telesoftware, no access charges (updated weekly).
* Save selected pages to disc/tape for later retrieval.
* Full access to all Teletext services and channels e.g.: CEEFAX, ORACLE, 4-TEL.
* Gives you a real-time clock at your disposal (*TIME).
* Software upgrades to allow for any enhancements to the Teletext service, e.g.: extra channels, full field data on cable & satellite systems etc. (only the media charge).
* Easy to follow comprehensive user guides.
* No hardware limitations, it can for example receive virtually unlimited numbers of channels.
* Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer (no more TV or Radio Times to buy).



WHAT THE REVIEWERS SAID:
". . .In terms of price, performance, future expansion possibilities and those little touches that show thought for the end user I would recommend the Morley unit."–*(Acorn User, January, 1986).*
". . .The Morley unit has been designed to ensure that its operation is simple and smooth. It is the ideal Teletext adapter for school use."–*(A&B Computing, June, 1986).*
". . .Using it over a number of months in different schools, it has proved utterly reliable, and may confidently be recommended."–*(The Times Educational Supplement, September, 1986).*
THIS IS THE BIGGEST SELLING TELETEXT ADAPTER CURRENTLY IN PRODUCTION WORLDWIDE, AND COMES WITH A FULL MONEY BACK SATISFACTION GUARANTEE.

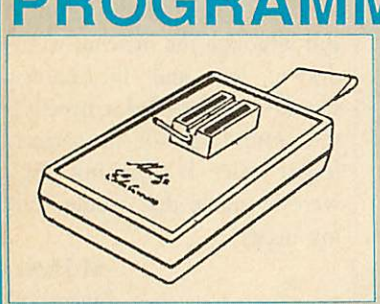
RAMDISC



Now available! The first true MEGA capacity RAMdisc for the BBC, BBC B+ and MASTER computers. This fully compatible unit, currently available in either 1 or 2 megabyte versions comes complete with operating software on ROM, power supply, and a comprehensive user guide.

FEATURES:
One megabyte of RAM connected to the 1mHz bus. Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase of speed, for example, a 20k mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc. The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS). The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive number is 4. Any 'Dangerous' *commands such as *COMPACT, *COPY, *BACKUP etc can be intercepted and the BBC's RAM from page 2 to &7FFF saved to RAMdisc workspace, and may be recovered using a *command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The filing system wedge ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter verifier and 'sector' editor for use with the RAMdisc. Catalogue structure allows up to 2,688 files.
Well that's the spec., add to this our usual 12 month no quibble guarantee and we're sure you'll agree the Morley RAMdisc is the sensible alternative if increased storage capacity and speed is your requirement.

EPROM PROGRAMMER V2



The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.
This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.
THE HARDWARE
The Unit is completely under software control, there are no knobs or switches to baffle the novice, and the extended features provided should excite the pro's.
THE SOFTWARE
The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.
The whole system is available now for less than the price of one WORDWISE chip. So get yourself the all new MORLEY EPROM PROGRAMMER V2 today and start using those expansion boards for what they were made for! ROMS.
Immediate delivery no quibble 12 month guarantee.

MASTER CARTRIDGE

Designed and manufactured by Care Electronics to Acorn specifications. These high quality Master expansion cartridges will take two 16k sideways ROM's, and will, unlike similar cartridges available from other manufacturers, accept the new second generation programs, such as Computer Concepts Interword and Spellmaster ROM's.
These Cartridges come in a high quality, robust, formed-plastic case, that fits neatly into either one of the Master's cartridge slots.

MASTER SMART CARTRIDGE

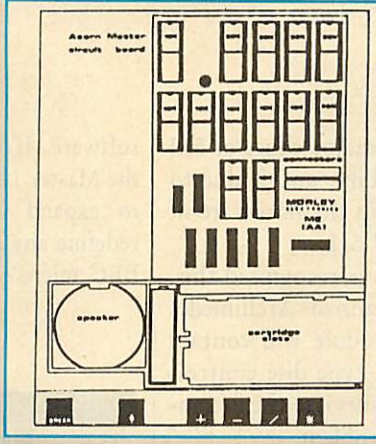
This device was designed and manufactured jointly by Morley and Care Electronics.
The **Smart** cartridge will at the press of a button halt any program running in memory and execute any one of a host of useful built in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination. The **Smart** cartridge will prive useful to the novice, allowing him to do the simple things like dump any screen to printer, and make backups of protected tape or disc based software, but has an open ended specification for the advanced 'HACKER' allowing advanced programming techniques to be incorporated into almost any program at the touch of a button.
BUILT IN FEATURES (at the press of a button)
Autosaves computer's entire memory.
Freeze program at any point.
Screen dump (any mode) to printer or disc.
Allows any OSCLI command without disturbing memory.
Copies 90% of protected software.
Tape to disc, disc to tape.
User friendly menu.
Sound On/Off.

ALL CARTRIDGES COME WITH A 12 MONTH NO QUIBBLE WARRANTY

MORLEY MASTER BOARD 'AA'

MORLEY ELECTRONICS

Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne & Wear NE28 6BY
Telephone: Tyneside (091) 2627507
Telex: 265871 A/B MONREF G
(Quoting Mag 70211)



At long last the add-on all MASTER users have been waiting for, an internal ROM board.

No more need to turn the computer off to insert the cartridge containing the ROM you need to debug the program in memory.

The new **MORLEY MASTER BOARD "AA"** allows you to have up to 8x16k and 4x32k extra Roms installed inside your MASTER and still leaves the *cartridge* slots free. This in effect allows your MASTER to support as many as 24, 16k ROMs installed permanently, whilst retaining the standard 4 x sideways ram banks and four banks by using cartridges

A staggering 32 ROM images installed and accessible at any time

Included in the package is a utility ROM which has many useful features such as 'FICOPY', a clever file transfer program that transfers files between DFS and ADFS formats or vice versa.

So for less than the price of four external cartridges you get a MASTER BOARD "AA" which with twice the capacity has got to be **THE** ROM expansion for the serious MASTER user.

The unit comes with the usual Morley, full no-quibble twelve months warranty, and our usual after sales service

THE COMPLETE RANGE OF TELETEXT SOFTWARE from M/B SOFTWARE

***NEW . . . DESIGN 7 PLUS** – now 'the best' is even better. Held in high regard by reviewers and hundreds of satisfied owners, DESIGN 7 has been further improved, with revised keystrip & even more features. Design/load/save and MODE 7 screen with ease, up to full CEEFAX/Oracle standard. Will convert ANY MODE 7 screen to a BASIC procedure, for inclusion in your own programs. ROM version includes a file copier, printer dumps useable from BASIC etc. B/MASTER/COMPACT.

TELETEXT EMULATORS/SCREEN DISPLAYS/INFORMATION SYSTEMS – A complete range of teletext programs to cater for all needs, with full teletext adapter interfacing.

***NEW . . . DESFAX** – totally new version – streets ahead of the competition – run your own information/display system. Stores hundreds of screens on dual 80 track drives (96 screens on single-sided 40 track), with access to any screen with a SINGLE KEYPRESS. Lots of special effects – screens can scroll, slide, overwrite etc. Animation, loops, subroutines – send for details – not enough space here to even begin to describe the advanced features!! B/MASTER/COMPACT

***NEW . . . MASTERFAX** – 84 MODE 7 screens in memory at once. 148 screens possible with cartridge RAM. An advanced teletext/carousel program featuring SINGLE KEYPRESS or 3-digit page selection. Runs entirely from memory – no disc accesses after pages are loaded. Superb animation and other effects. MASTER/COMPACT only.

***NEW . . . VU-FAX** – 1000 screens and no disc accesses! Screens stored on MORLEY 1MByte RAM DISC. SINGLE KEYPRESS gives instant access to any screen (or emulate teletext). This is the ultimate MODE 7 screen management system – there is nothing else like it. MODEL B/MASTER 128.

***ALSO . . . MASTERcopy** – DFS/DFS, DFS/ADFS, ADFS/DFS, ADFS/ADFS file copier. Uses the MASTER 128's memory to the full to permit fast disc copying. 31 DFS files to ADFS disc in less than 2 minutes. Creates directories automatically. You will wonder how you ever managed without this program. Described by reviewers as 'unexcelled'. MASTER 128 and COMPACT's fitted with DFS ROMS.

ORDER FORM

To order simply complete and return by post enclosing your cheque/P.O. made payable to Morley Electronics, or by phone during office hours, quoting your ACCESS or VISA number.

Morley Electronics, Unit 3 Maurice Road Industrial Estate, Wallsend, Tyne & Wear NE28 6BY Telephone Tyneside (091) 2627507.
Telex: 265871 A/B MONREF G (Quoting Mag 70211)

ALL PRICES INCLUDE VAT @ 15%

	Item	Price	P&P Rate		Item	Price	P&P Rate
Qty. _____	Morley Teletext Adapters	119.95	(a)	Qty. _____	M/B Software Design 7+	9.95	(c)
Qty. _____	Optional Power Supply	9.95	(b)	Qty. _____	M/B Software Desfax	19.95	(c)
Qty. _____	Teletext Utilities on disc	5.95	(c)	Qty. _____	M/B Software DesROM	12.95	(c)
Qty. _____	1 Megabyte RAMdisc	199.95	(a)	Qty. _____	M/B Software Mastercopy Disc	12.95	(c)
Qty. _____	2 Megabyte RAMisc	349.95	(a)	Qty. _____	M/B Software Mastercopy ROM	14.95	(c)
Qty. _____	Eprom programmer V2	34.50	(b)	Qty. _____	M/B Software Masterfax	29.95	(c)
Qty. _____	Master ROM boards "AA"	45.95	(b)	Qty. _____	M/B Software VU-Fax System inc RAMdisc	249.95	(a)
Qty. _____	Master RAMdisc/SWR cartridge	P.O.A.		Qty. _____	5.25" Floppy discs x 10	7.95	(c)
Qty. _____	Care Master ROM cartridges	8.95	(b)	Qty. _____	27128 16k CMOS EPROM	3.65	(d)
Qty. _____	Master Smart cartridge	39.95	(b)	Qty. _____	Info Pack + Demo Disc of all Software	FREE	(c)

Please delete: Adapter software on **ROM/Sideways RAM format**/Software on **40/80** track disc

Name ______________________ Phone no. ______________________

Address ______________________

______________________ Post Code ______________________

Cheque No ______________________ Access/Visa No ______________________ Amount £ ______________________

ACCESS VISA

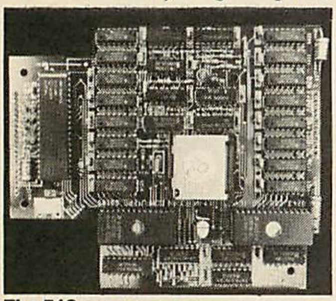
Please add Postage and Packing @ a=£3.00 b=£2.00 c=£1.00 d=£0.65 (when ordering more than one item, add P&P. on highest rate item only)
GOVERNMENT, LOCAL AUTHORITY, AND TRADE ORDERS WELCOME. Please allow 28 days for delivery

SYMPHONY SURPRISE

Sir, I was surprised at Graham Bell's article in November's issue saying that Lotus *Symphony* wouldn't run on a Master 512. Maybe the earlier versions of either DOS Plus or *Symphony* caused a crash, but my copy of *Symphony* runs perfectly. Even the graphs are displayed on the screen.

I have DOS Plus version 1.2, *Symphony* release 1.1 and I've selected IBM colour card and colour monitor in the SETUP program. I copied *Symphony* successfully to the 800k Acorn disc format, and I haven't experienced a single problem.

Two other programs that worked, to my big surprise,



The 512 co-processor

were *Micro-CAP II* from Spectrum software (V1.7) and *Draft* V1.20 from Orcad. The only problem with *Draft* is the memory. I solved the problem by deleting a few libraries from the DRAFT.OVL file with the Norton disc editor. You don't have many libraries in memory but the program works, and that's the main thing.

Keep up the good work on *Acorn User*.

Mike Philippens
Gorinchem
The Netherlands

To copy onto an Acorn DOS Plus disc, you must have an unprotected version of *Symphony*. Most copies are protected, and won't run because the 512 can't read the discs. This is *the* major cause of 512 incompatibility, and is due to differences in the hardware of the PC and 512.

Acorn have recognised this, and the planned Archimedes MS-DOS podule will contain its own PC-type disc controller chip to alleviate the incompatibility problem.

BBC RUNS PC SMART

Sir, I have a BBC B with a 512 board used via a Watford Co-Pro adapter and so far have found a good deal of compatibility with several programs I have tried.

The *Smart* system works well (except for the communications software) especially the spreadsheet output graphics producing 3-D pie-charts, bar and line graphs. *WordStar, Freestyle, Galaxy, dBase II* and *Supercalc 2* all work well.

I am using the Microsoft Macro Assembler successfully, and also find Turbo Pascal from Borland runs well.

Microsoft's flight simulator works perfectly (using the key setup for the IBM PC Jr). Both GW Basic and Advanced Basic work but both suffer from the inability to Break into a listing, thus hampering writing programs in Basic.

You may wish to know that despite the claims of Acorn and various dealers I have contacted that it cannot be done, the BBC B with 512 board *can* produce the missing IBM keys which are found on the Master 128 keyboard. (INSERT, DELETE, HME, END, PGUP, PGDN,) using a short resident COM program.

Having written it and used it for a few months I have tested several programs with success thus making the BBC B compatible with a wider range of software. It will also work on the Master 128 and I am hoping to expand it so that it can redefine any of the keys on the BBC micro's keyboard.

A Katz
Middlesex

BIGGER TREES

Sir, Many people are interested in tracing their family trees and get frustrated with the limitations of the 32k memory on the BBC micro.

Readers who are trying to trace their family tree might be interestd to hear that I have been using the *Personal Ancestral File* – a genealogical management system for home computers – with my Master 512. The version of the program runs with MS-DOS 2.0.

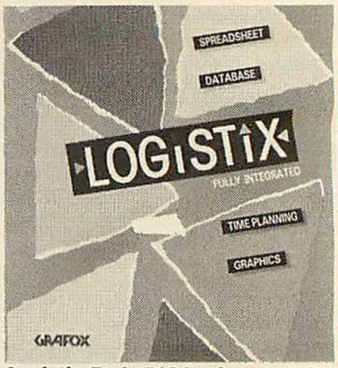
The program was originally created for the IBM PC. It will run happily on the Master 512 with no problems that I can see. The configuration lists no less than 18 printers it is compatible with!

You may ignore the more obvious Mormon influences in the program, but it will:

- Record genealogical information both for individuals and families.
- Enter an unlimited number of names. If you fill a disc, you continue on another, although you can't link names on separate discs.
- Tie family lines together.
- Enter notes and sources for each individual.
- Produce 'pedigree' charts, descendants charts, family group record forms and sorted lists of relatives.

The program is available from the Genealogical Society of Utah, 751 Warwick Road, Solihull, West Midlands B91 3DQ. The cost is £25.

Alan Clamp
Manchester



***Logistix*: Early 512 business pack**

FACTS ON FORTRAN

Sir, I wish to acquire a Fortran compiler for a Master 512, but have been put off by doubts as to which versions work with the 512, and which require linkers or special boards.

The cost often precludes an experimental attitude and whilst I am prepared to pay as appropriate for something that works well, I cannot afford to gamble, so more information would be appreciated.

David Fox
Wiltshire

Lawson Wakefield provided our comments for the November issue so we'll quote him in full.

Prospero Fortran 77: 'High quality Fortran 77 compiler. Linker and librarian work too. Can produce sound via call to SYS which can call Osword. Expensive, but a stripped down version at £99.95 with GEM bindings is due soon.

Fortransoft F77: 'Subset which includes graphics routines. Not up to full ANSI spec but only costs £30!'

Ryan McFarland's Fortran 77, the 'heavyweight' of the trio, isn't compatible.

Good PC dealers should carry these, otherwise contact Grey Matter, 4 Prigg Meadow, Ashburton, Devon TQ13 7DF. Tel: (0364) 53499.

PRINTER DRIVER SOLUTION

Sir, Like W Percival in November's Letters, I tried to use the *View* printer driver from October, made the error of omitting the space from line 1300 and had the 'Disc full at line 1540' message. Having found and corrected this error, I now receive the error message 'Not found at line 1540' if I try to save the program on my Master Compact.

Sadly this letter had to be printed without the benefit of the enhanced printer styles available on my Panasonic KX-P1081, but it would be much appreciated if you could help to remedy this.

Thank you for the many interesting and useful articles each month. As a relative newcomer to BBC machines I find the balance of novice and experienced articles very helpful.

P Matthews
Harrogate

What the Hints & Tips article failed to make clear is that the printer drivers are saved in a directory called P. On the Compact running ADFS, you simply have to create a directory called P before running the program. This is done by:

***CDIR P**

This is a common error for users new to ADFS and it is well worth getting used to the directory ideas on the Compact and Master. Many people who typed in Joe Telford's ADFS front-end from June's issue had problems because they got confused as to which directory they were in – it's easily done!

Hierarchial filing systems such as ADFS are common on most professional micro systems and standard on Compact, Archimedes and Econet. If you have the June 1986 issue, Joe's Jottings tackled filing systems and explained the 'tree' structure of ADFS.

WARGAMER SEEKS AID

Sir, I am a keen wargamer and I would like to computerise my wargaming rule book. I have seen most of the commercial wargaming software and I am looking for something more specific to my theme (NATO v Warsaw Pact). I have a good set of rules for playing 'miniature' wargames with models.

Is there anyone you can suggest who could write such a program for my use or give me some pointers about how I may go about writing one myself. I am relatively new to the BBC (Master) and I would appreciate any help or advice.

Ian Bell
Oxfordshire

There is a games group called Veni Vidi Vici whose members are involved in computing. The address is c/o Brian Frew, 40 Thorne Close, Astley Bridge, Bolton BL1 6PE.

Other sources of information would be one of the several adventure magazines which often cover wargaming, or you could try contacting a nearby user group (see *AU* December p205, or through Micronet).

CHANCE OF SCOTS SHOW?

Sir, Is it likely that BBC micro shows might be held in Scotland? There are many in London, but it's a long way to go from Aberdeen. I should be interested to know if it's possible to buy disc drives and printers at these shows.

Mary Kelso
Keith



Packed *Acorn User* Show

I doubt if any of the big London shows will come to Scotland. However, I hope you supported the recent SATRO Show in Aberdeen and the other occasional Scottish shows. You can buy most things at exhibitions, including printers and disc drives, often cheaper than mail order – but what you save on price is often paid in travelling and fighting your way through crowds. There are two dealers in Aberdeen: J G Bissett in Upper Kirkgate and Microworld in Holborn Street.

SUPPORT FEARS ALLAYED

Sir, I was recently in the UK on holiday and had much opportunity to observe the BBC market. I drew comparisons with the scene in 1984 on a previous visit. This time I was astonished to find the Acorn range almost completely absent from the shops and I feared the worst for the company.

However, a visit to Watford Electronics put things in perspective. I would like to thank Mr Jessa, if I may, for the time he took to explain the situation in the computer market and to show me around.

We in New Zealand rely heavily on mail-order to the UK so I have been able to tell the local users here in Wellington at least that we can rely on support from the UK for a while yet.

Brian Cattermole
Upper Hutt
New Zealand

Since 1984 Acorn computers have indeed disappeared from the High Street as the company has pulled out of the volatile home market. However, they are still available from dealers, the larger department store chains, and, of course, by mail-order through advertisements in *Acorn User*. This trend is even further reinforced with the launch of the Archimedes.

HELP WITH STATISTICS

Sir, I am in my final year of studying for a degree in mathematics and computing and I'm doing a project on educational software.

The project partly consists of a review of the software available to students dealing with statistics. I'm particularly interested to discover the range of statistical topics they cover and if there is any need for them to be improved.

I'd appreciate any help you could give.

Miss N Pawar
Middlesex

Three statistics packages reviewed in *Acorn User* in April 1986 were *Statcalc* from Macmillan in London, *Statspack* from Chalksoft in Spalding, and *Unistat* from Unisoft in London. Another comprehensive pack is *Instat* from the University of Reading Statistical Centre.

A book you may be interested in is *Advanced Statistical Analyis on the BBC Micro* by N W Please from Edward Arnold at £13.50.

HINTS & TIPS

Martin Phillips explores the intricacies of printing labels and looks at readers ideas on DFS, Aries B32, saving, compacting and strings

PRINTING LABELS FROM WORDWISE PLUS

It would be a good idea to write an article on printing labels from *Wordwise Plus*, the editor suggested one day. At the time I too thought it was a good idea, especially as this did not seem to have been covered anywhere else. My feeling of confidence soon evaporated when I actually tried to write the program. Usually, it's long after you start such a project that you begin to realise all the difficulties. This project was no exception, and it did uncover several shortcomings in the *Wordwise Plus* programming language.

With any brief like this, you must define all you want the program to do before you start out.

- It should be possible to enter or update the names and addresses easily. A standard *Wordwise* file should be used to produce the lists
- It should be possible to print out just part of the full list
- It would be useful to include telephone numbers with the addresses
- The label printer should allow for a variety of label shapes and sizes
- It would be useful to be able to print multiple copies of any one label or group of labels
- An added bonus would be to include a mail merge option.

It sounds simple, but in practice it was very hard going. First, the format for the *Wordwise* address list was decided. This was the easy part! A standard set of headings were typed in and then copied as many times as required using the markers and function key f9 to copy the marked text. The format for each address is:

```
CODE :
NAME :
AD 1 :
AD 2 :
AD 3 :
AD 4 :
PCDE :
TELE :
```

The code number at the top should be in the range one to nine. It is used to select subgroups. For example, labels could be printed for just subgroup one. If zero is used for the code then the address will always be printed out. The program asks which code is to be printed. Entering 0 (or simply pressing Return), will print out the full list.

The name is entered on the next line, followed by four lines for the address. If the address only requires three lines, then the last line should be left blank, though the heading – right up to and including the colon – must remain in place. Finally, there is a line each for the post-code and for the telephone number. A completed entry will look something like this:

```
CODE :2
NAME :Acorn User
AD 1 :Redwood Publishi
ng
AD 2 :20-26 Brunswick
Place
AD 3 :London
AD 4 :
PCDE :N1 6DJ
TELE :01 490 1444
```

It does not matter how many line spaces there are between each address, and including other text should not upset the program. The program searches for the first colon, and ignores any other text, so this character should be avoided.

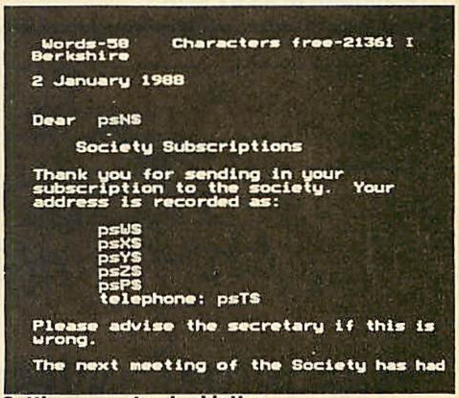
After deciding on this 'input form', the next problem was the heading at the start of each line. This is there to make it easy to enter the address correctly, but the *Wordwise Plus* language has very poor text handling facilities. There is no equivalent of LEFT$, MID$ or RIGHT$. In Basic you could use:

```
L$="NAME :Acorn User"
T$=MID$(L$,7)
```

to remove the 'NAME:' heading. Also in *Wordwise Plus*, there are only 26 strings allowed, and the room allowed for variables (including strings) is a mere 600 characters. In Basic, you could use arrays to great effect; in *Wordwise Plus* this is not possible, so the programming methods have to be much more crude to achieve the same result.

Listing 1 on the yellow pages is the simplest program to print out addresses. It puts each address below the previous one so is only suitable for use with labels supplied one across the page. This listing should be stored in segment zero, where it can be called up from the main menu by pressing Shift-f0. The program loads an address file into segment one, and then goes through the names and addresses, transferring some to the main text area. Then the main text is printed out.

To get the line spacing and indenting correct will take some practice. O% determines how many blank lines should be left between each label. This should be changed to ensure that the spacing for your labels is correct. Tabs are inserted before each line of each address, therefore the Tab command should be adjusted to indent the address so that it is printed near the middle of the label. An emphasised print code is also included to show the method of inserting printer codes and the place to put them. At the end a printer reset code will be issued.



Setting up a standard letter

Most printer labels are designed to work with normal line spacing, but you might get problems where the line spacing is not quite correct. If the print gradually runs off the label after several labels have been printed, then you'll need to adjust the line spacing. As the adjustment here is in very small increments, this needs setting up carefully. The command to use is:

```
OC27,65,n
```

where n is the line spacing in 72nds of an inch. The number n is normally set to 12 to give 1/6th-inch spacing.

Having the whole address list stored in a segment has its advantages. It is especially convenient for tape users. It is easy to add further names, or change the codes for certain addresses. Listing 1 loads in a file

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automatically as it is all too easy to forget to do this. This feature might prove to be inconvenient for some applications, so the routine to load in a file can simply be deleted, and the file loaded 'manually' into segment one at the start of a session. Also, if you always use the same filename, that can be put in the program to save having to supply a filename each time.

It should be noted that there is no error trapping on the filename, and any loading errors with these text files will result in an error being generated which stops the program in segment one.

The '¦T' is the code used to produce the Tab symbol, and '¦R' is equivalent to a Return. '¦G' – the same as function key 1, a green code. '¦W' is the same as function key 2, the white code.

Sometimes sticky labels are supplied on sheets two or three to a line. Using listing 1 will mean that some labels are wasted. Feeding the labels through the printer more than once should be avoided, as it can loosen them from the backing paper and they can jam in the printer. If this happens, it is often a dealer's job to clean the printer. For this reason, it is also very unwise to use reverse feed with these labels! While on this subject, remember to alter the paper thickness control on the printer to suit the thickness of the labels, and also remember to reset it when the ordinary printer paper is put back. Most printers have this control to one side of the roller. Labels are two or three times as thick as normal listing paper. Set the thickness correctly and the labels will print more quietly and be less liable to jam.

Listing 2 allows sheets with any number of labels across to be printed. This is much more complex than listing 1 because of the need to store two or more sets of addresses at once. There is only just enough variable space to allow a maximum of three labels on a line, and almost all the string variables would be used, resulting in a very clumsy and long-winded program. Another tactic tried was to set the cursor in the main text area to the right point for the next address, but this proved to be difficult to achieve, especially when some address lines were more than 40 characters long.

The method adopted was to store each part of the address in a different segment so that effectively each segment holds one line of text. This way, it is possible to cope with even more than three labels per line. One difficult problem that arose from this technique was that switching between all these segments, the cursor was reset each time, so the program kept re-reading the first address. After much effort and perspiration, I gave up trying to find a solution to this, and reverted to loading in the text file bit by bit. This worked with no problems, though it isn't much fun for tape users. It takes a normally-saved *Wordwise* file in the format described above. The program has settings to allow for the number of labels on a line, and the horizontal and vertical space between each label. N% is set to the number of labels per line, O% to the number of lines between labels, and the Tab command is used to space between the labels on a line. If you're using an extra-wide printer with full width labels, then the line length should be increased accordingly. Again trial and error will determine the correct parameters. To save wasting labels, this can be carried out using normal printer paper, laying each trial sheet over a sheet of labels. Normal printer paper is thin enough to see the labels underneath.

Sometimes it might be useful to print out more than one label for each address. After all the problems of listing 2, it was pleasing to find a simple solution to this option. The .inputaddress procedure stores the address in the main text area using the .store procedure. All that's necessary is to alter .inputaddress so that the .store procedure is called up as many times as wanted. Change the end of the procedure to read:

```
T$=A$
DOTHIS
PROC store
TIMES 4
ENDPROC
```

The two new lines are all that needs to be added, and will make the program print each address four times. This number could be put in at the start of the program using a variable. To do this, insert the following lines in listing 2:

```
  IF G%=0 THEN PRINT "al
l"
  PRINT
  PRINT "Enter number of
labels ";
  R%=VAL(GLK$)
  IF R%=0 THEN R%=1
  PRINT
  PRINT "*** Please wait
 ***"
```

and change .inputaddress to something like TIMES, R%.

Listing 3 on the yellow pages is very similar to listing 1, but it just prints out names and telephone numbers as a list. Again the codes can be used, to select a subgroup, or the whole list can be printed out as required.

Finally, it would be useful to be able to use this address list in mailmerging. This is where a standard letter is printed out several times, each with an individual name and address. The program to do this is a simple adaptation of listing 1. Any of the lines of text stored for each address can be inserted any number of times at any point in a standard letter, and of course the code option can be used to include only some addresses. A standard letter should be written and stored in segment 9. Each line of the address is stored as a string:

- N$ gives the name
- W$ gives line 1 of the address
- X$ gives line 2 of the address
- Y$ gives line 3 of the address
- Z$ gives line 4 of the address
- P$ gives the post-code
- T$ gives the telephone number

To include these in the standard letter use the format:

```
<f1>psN$<f2>
```

This will print the name when the letter is printed. The standard letter in figure 1 shows how such a letter would be set up.

Listing 4 is the mailmerge program. Although again similar to listing 1, there are several minor changes – a Return is not placed after each string for example, so it should be checked carefully. This program transfers the standard letter from segment 9 to the main text area, then searches through the address list to find the appropriate address. Next a letter is generated, printed and deleted, and then the next letter is processed.

Suddenly *Wordwise Plus* comes alive, and all the difficulties are worth it!

NEW DFS FEATURES

Last August's Hints & Tips included an article which covered the use of the 1770 DFS. Watford Electronics has asked me to point out that the latest versions of its single- and double-density DFS software now don't require the use of the *ENABLE command before backing up or destroying a series of files. Also, Andrew Love has discovered a new option in the Watford DFS. Adding a 0 after the drive

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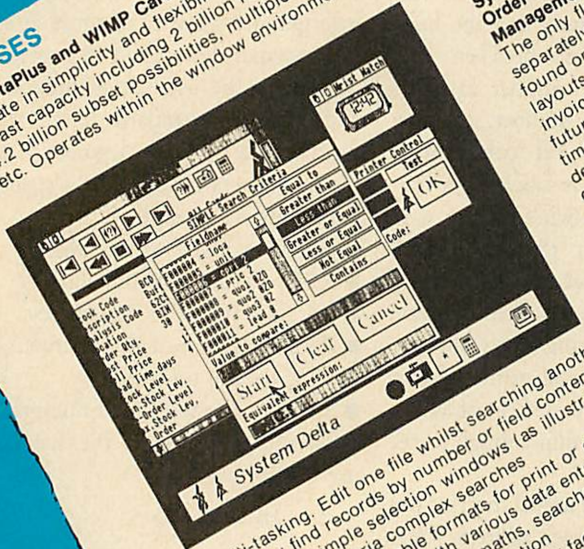


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number when using the *FORM command to format a disc, makes that disc automatically double-step. Double-stepping is a way of reading 40-track discs on an 80-track drive – the drive head moves twice as far *as normal* between tracks. Double-stepping can be set manually on the Watford or Acorn DFS software, but the new option is a boon for 80-track disc users.

£5

ARIES B32 TIP REVISITED

Nigel Thomas from Leeds has written in to point out a problem with the Aries B32 tip published in the September 1987 Hints & Tips. He wins a crisp £5. On disc machines any star commands not recognised are treated as *RUN commands, and time is wasted while the disc is checked for that program. This can be overcome by switching to *ROM (or *TAPE), first and switching back to the disc system once the check has been made. Nigel goes on to point out that this method cannot be used within a procedure. He suggests that a flag can be set at the start of the program to overcome this problem. The flag is set according to whether a simple *SAY command causes an error. If it does *SAY can be avoided for the rest of the program.

```
   10 flag%=TRUE
   20 ON ERROR GOTO 1000
   30 *ROM
   40 *SAY HELLO
   50 *DISC
   60 REM .... rest of pr
ogram

   100 DEF PROCoutput(A$)
   110 PRINT A$
   120 IF flag% THEN PROC
speakout(A$)
   130 ENDPROC


   200 DEF PROCspeakout(w
ord$)
   210 OSCLI "*SAY "+word
$
   220 REM OSCLI seems to
 need the * here in call
s to Speech
   230 ENDPROC


  1000 IF ERR=254 AND ERL
=40 THEN flag%=FALSE:GOT
O 50
  1010 REPORT:PRINT" at l
ine ";ERL
```

This is a bit inelegant, but in most versions of BBC Basic such a technique has to be used. It's interesting to note that Basic 5 on the Archimedes has much better local error handling, partly for circumstances like the ones mentioned.

£5

SAVING PROGRAMS

When typing in listings or developing programs, it is always wise to save the program every so often. We all know this, but tend to ignore it, at least until a program is lost.

M S Hatch from Blackburn wins £5 for a simple routine to make the regular saving of programs easier. Define function key 0 as follows:

```
   *KEY 0 "SAVE |"PROG2|
"|M*DELETE B.PROG|M*RENA
ME PROG B.PROG|M*RENAME
PROG2 PROG|M"
```

The filename can be changed from 'PROG' to a more suitable one if you wish. To use the routine, just press function key 0 every 15 minutes or as often as you want. The program is saved to disc, and the old version of the program on disc is put in the B (back-up) directory. To do this, it first has to delete the old backup copy, then rename the old program and latest version.

£5

ADFS COMPACTING ROUTINE

Mr T W Blunt from Berkshire wins £5 for a very novel and delightfully simple tip. On the ADFS the *COMPACT routine does not work in the same way as the DFS *COMPACT. Using *COMPACT will not fully compact an ADFS disc. It gets rid of some of the wasted space on a disc, but it leaves many more spaces that need to be squeezed up. Some long-winded solutions to this problem have been published, but Mr Blunt uses a very neat, and legal, trick to test that the disc is fully compacted. The program is only two lines long and can be created using the Master 128's Edit, without using line numbers. It should then be saved as ALLCOMP so that it can be called up from disc using *ALLCOMP

```
   *KEYO MO.135:*COM. OE
72|M*MAP|M IF VPOS<6 CLS
:P.''"Compacted"ELSE *FX
138,0,128|M
   *FX138,0,128
```

This routine works by testing to see how many spaces there are after printing the map, by looking at the screen cursor position. If there are six or more spaces on the disc, then the disc is compacted again. I suspect there must be many more elegant uses for this technique.

£5

STRING RECOGNITION

Andrew Lowe wins £5 for a useful tip regarding string recognition. If a program is designed to accept language-like commands and abbreviations are required, use a line like this to check inputs:

```
   IF A$=LEFT$("PRINT",LE
N(A$)) THEN ...
```

This will check the right amount of letters of the given word against the string to be tested. So it will accept P, PR, PRI and so on. However, like any other language, any abbreviations are likely to become ambiguous and the line which gets the string first will be the one which accepts it. And watch out – it'll accept A$ if A$ is blank.

HEXADECIMAL HEADACHES

Do you use a complicated function to turn an ordinary number into an hexadecimal string? You can use the ~ operator to make a number print in hex:

```
PRINT ~255
```

But did you know you can use the same operator to make up hexadecimal strings? For example:

```
 10 a%=255
 20 hex$=STR$~a%
 30 PRINT hex$
```

The computer displays 'FF', not '255', because this is the hexadecimal representation of the number 255.

Taking input from the user in hexadecimal is nearly as easy. This uses the little-used EVAL keyword, to get the numerical equivalent of a string:

```
 10 INPUT "hex &" hex$
 20 a%=EVAL("&"+hex$)
 30 PRINT a%
```

Running this program results in a prompt including the '&' character; this is just there to remind you it's unnecessary to include the '&' in the hexadecimal number you type in. Enter something like 'FF', and the program will print '225'.

Turn to page 113 for details of the listings

FIRST BYTE

READING LESSONS

It's all very well reading data in order, but what do you do if you want to select it at random? Here's how

Tessie Revivis

Reading data from a file is relatively easy. Providing the data is in the right order in the file, you can just use Osbput and Osbget, as I described last month. But what happens if you want to read the data in a different order? For example, think of a file containing the names of a thousand people – these names could be assigned a number, zero to 999, which relates directly to their position in the file. If the name of the 931st person was required it could be read by starting at the beginning of the file, and then reading the first 930 names to arrive at the 931st entry. It does the job, but it is time-consuming, as the first 930 names could take quite some time to read. It would be much better and simpler to be able to go straight to the right entry and pluck it out.

Luckily this is possible using a technique known as random access, so called because the contents of a file can be accessed in any order you want. You don't have to start at the beginning of the file every time; you can move directly to any other position in the file. Note that this type of technique is not available on the cassette filing system, because the cassette cannot be wound back and forth accurately enough to specific points on the tape.

The key to random access is the file pointer, which was introduced last month. Normally the pointer starts at the first entry of the file and moves on one position each time a byte is read. It is possible to override this and force the pointer to move to any given position in the file. After this is done, the next byte read will be from the place indicated by the new pointer. The actual moving of the pointer is done from Basic using the statement:

```
PTR# file%=newpointer%
```

where file% is the file handle.

Listing 1 on page 49 (over), is an example of random access using the PTR function. When run, the program writes the values 100 to 199, in order, to a file called 'TEST', and then it prompts you to enter a value for the pointer. The value you enter should be between 200 and 100, and it is used to move the PTR value of the specified amount through the file. The program then prints the value corresponding to the given pointer.

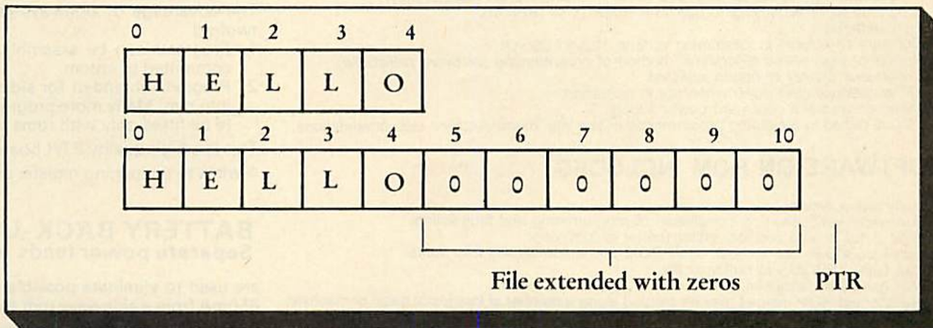


Figure 1: File extended using zeros

The same result can be obtained in machine code by using a call (a JSR) to the operating system routine named Osargs, at &FFDA. Before making this call, the processor registers must be set up so that the call can work correctly. The accumulator must be one, the file handle should be in Y, and X should point to a four-byte area of zero page memory. This area should contain the new file pointer.

The value placed into the X register is not as complicated as it might at first seem. For example, if the new pointer value has been set up in locations &70-&73 then X should be set to &70 before the call.

Listing 2 does the same as listing 1, but by using calls to the machine code routines Osfind, Osbget, Osbput and Osargs instead, it illustrates how the pointer could be changed in machine code.

It is also possible to read the file pointer. From Basic the statement is:

```
pointer%=PTR# file%
```

which will set the variable pointer% to the current file pointer for the given file. An Osargs call is used to read the pointer too, but this time with the accumulator containing zero. The pointer is read into the four bytes of zero page pointed to by the value held in the X register.

When you are using listing 2 to change the file pointer, what happens if a value was entered that would move the pointer beyond the end of the file – by entering a value of 300 for instance? The file pointer cannot go beyond the end of the file. The Osargs routine (which is used by the Basic PTR command) can detect where the end of a file is.

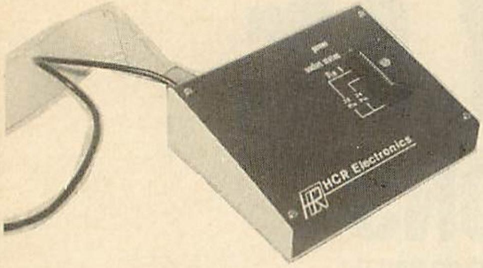
Running the program and entering any value of more than 100 for the pointer will give an error depending on the filing system in use as follows:

- ADFS: 'Outside file on channel xx', where xx is the channel number.
- DFS: 'Read only'

Sometimes it will be necessary to find out just how long a file is, and there's a special function for this. From Basic a statement in the form of:

```
length%=EXT# file%
```

will set the variable length% to the current size of the file. The EXT function uses the Osargs routine, so this is also possible from machine code. This time the call is made with two in the accumulator and the file handle in Y. Again X points to four



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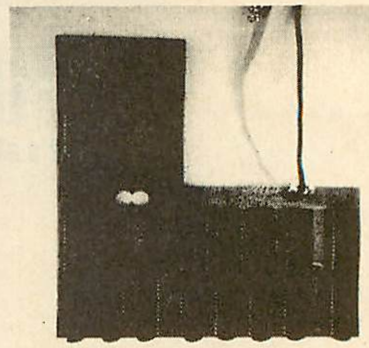
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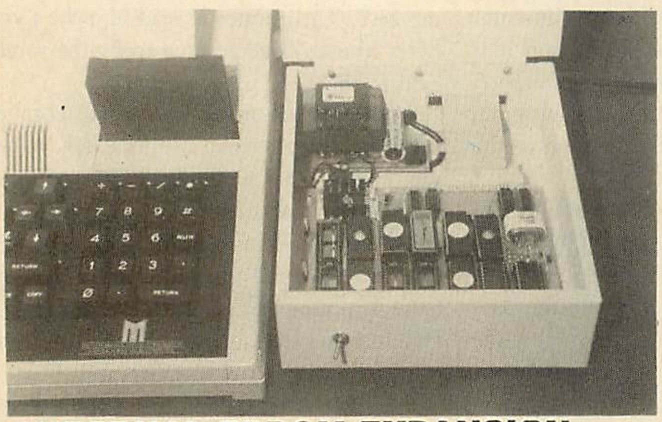
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bytes of zero page memory, where the file size will be put.

This all assumes that the file has been opened for reading bytes. However, it is possible to alter the pointer for a file that is opened for writing or updating. In this case, if the pointer is moved beyond the end of the file, the file is simply extended so that it is just long enough to contain the pointer. For example, if an output file was 20 bytes long and an attempt was made to set its pointer to 165 then the file would be lengthened to 166 bytes making the pointer point to the last byte in the file. This is illustrated in figure 1.

On earlier versions of the Disc Filing System or Basic (as supplied with the BBC B, B+ and Electron micros), this is the only way to change the length of a file. The problem here is that the pointer's value is also altered.

Altering the length of a file without changing the pointer is a rather more complex matter. Using ADFS, ANFS and the latest versions of DFS (2.41 onwards) it is possible to write the length of a file opened for output or update, again by using Osargs.

For this call, the accumulator should contain three, and Y should contain the file handle as usual. X should point to four bytes of zero page, which should contain the desired file length.

The Basic equivalent of this call is only available on Basic 4:

```
EXT# file%=newlength%
```

So far we have only looked at using random access on single bytes of data held within a file. Each byte is an entity in itself – a record. The file pointer can be used to locate any desired record. Say you want record 55; you just set the file pointer to 55 and read the data. This works because each record is just a single byte. It is fairly simp' .o randomly access records longer than one byte, provided that all the records are the same length. This is done by multiplying the desired record number by the length of each record, to get the value with which to set the file pointer. This is illustrated in figure 2.

Listing 3 on the yellow pages, is a Basic program which creates a file of names. These can then be extracted from the data file by entering a number between one and the maximum number of names.

To ensure that each name is the same length, the program first scans the list of names to find the longest, and then pads out all the others with spaces to length. The difficult thing about doing this in machine code is the multiplication. This was covered in First Byte in August, but with files like these, it is usually more convenient to make each record a nice, easy length, perhaps 128 or 256 bytes long. With 256-byte long records, the seventh record can be read by putting seven in addresss &71.

The other three bytes of the four-byte block in zero page (&70-873) can be set to zero. Then set X to 870 and call Osargs in the normal way.

You could try this. Alter listing 3 with the following line:

```
145 maxlen=256
```

and it will produce the file 'NAMES' with a record length of 256. You should be able to write a machine code program to read back any of the records using the techniques you've learnt this month.

Table 1 summarises the uses of the operating system routine Osargs, outlined above. In each case the Y register should contain the file handle and the X register should point to a block of four bytes in zero page.

Please turn to the yellow page index on page 113 for details of First Byte listing 3.

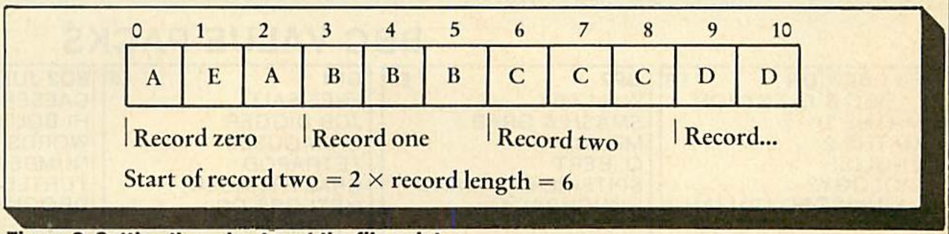


Figure 2: Getting the value to set the file pointer

TABLE 1: USES OF OSARGS

Value in A	Function
0	Read pointer
1	Write pointer
2	Read length
3	Write length

```
   10 REM First Byte Lis
ting 1
   20 REM By Tessie Revi
vis
   30 REM For B/B+/M/C/E
   40 REM (C) Acorn User
 January 1988
   50 :
   60 ON ERROR CLOSE# 0:
REPORT:PRINT:END
   70 file=OPENOUT"TEST"
   80 FOR count=100 TO 1
99
   90 BPUT# file,count
  100 NEXT
  110 CLOSE# file
  120 :
  130 file2=OPENIN"TEST"
  140 REPEAT
  150 INPUT ''"Enter poi
nter value " point
  160 PTR# file2=point
  170 PRINT "Pointer ";
PTR# file2,"Value "; BGE
T# file2
  180 UNTIL FALSE
```

Listing 1: Random access using PTR function

```
   10 REM First Byte Lis
ting 2
   20 REM By Tessie Revi
vis
   30 REM For B/B+/M/C/E
   40 REM (C) Acorn User
 January 1988
   50 :
   60 ON ERROR A%=0:Y%=0
:CALL osfind:REPORT:PRIN
T:END
   70 osfind=&FFCE
   80 osbput=&FFD4
   90 osbget=&FFD7
  100 osargs=&FFDA
  110 $&900="TEST"
  120 A%=&80
  130 X%=&900 MOD 256
  140 Y%=&900 DIV 256
  150 Y%=USR osfind AND
&FF
  160 FOR count=100 TO 1
99
  170 A%=count
  180 CALL osbput
  190 NEXT
  200 A%=0
  210 CALL osfind
  220 :
  230 $&900="TEST"
  240 A%=&40
  250 X%=&900 MOD 256
  260 Y%=&900 DIV 256
  270 Y%=USR osfind AND
&FF
  280 REPEAT
  290 INPUT ''"Enter poi
nter value " point
  300 !&70=point
  310 X%=&70
  320 A%=1
  330 CALL osargs
  340 PRINT "Pointer ";P
oint,"Value ";USR osbget
 AND &FF
  350 UNTIL FALSE
```

Listing 2: Using calls to machine code routines

ACORN FORUM

David Atherton introduces a selection of readers' advice and insights into the Acorn micros

£15

BINARY CONSTANTS

Andrew Piskozub from Bradford has been working on extending Basic. Not for him the simple task of adding a new keyword: Andrew has implemented a new number base, bringing the binary representation of numbers, as used in Microsoft Basic, and latterly BBC Basic 5, to BBC Basic versions 1 & 2. Andrew points out that this is particularly useful in assembler where binary values often make more sense, especially when performing logical operations like AND and OR.

With Andrew's extension to Basic installed, you can directly type such commands as LDA #%10100101 or PRINT %11001111. Andrew has also provided a reverse translator; just as tilde (~) is to ampersand (&), so pound (£) is to per cent (%). A slight difference is that ~ 200 is still a number, witness the necessity to use STR$ to turn it into a string, whereas Andrew's £ operator converts directly into a string. So A$=£15 would work, A$ becoming '1111'. Leading zeros are stripped automatically.

To use the program, type in listing 1 in the yellow pages and run it. It will save machine code program called 'BINARY'. This should be * RUN before attempting to use the new operators. The extension will stay in force until Break is pressed. It may be reinstated b , ping CALL &CBF: you may like to program that into key 10. The program resides at &C00, but you can assemble it anywhere else by altering the value of code%.

The program will only work with Basic 1 and 2. The prime source of information on the Basic ROM, Mark Plumbley's *Advanced Basic ROM Guide* from Adder Publishing, predates the Master's Basic 4, so I don't know the entry points for this version of Basic. If anyone has worked out the same entry points for Basic 4, I would be most interested to hear about it.

This is an excellent demonstration of how to graft on an extension to Basic. The routine works by intercepting the BRK vector and checking for either of the new symbols whenever error 26 'No such variable' occurs. If neither symbol is found, control is returned to the ROM via the old BRK vector.

For the '%' symbol, Basic's integer accumulator is first to set to zero. The binary number is then read in, and the carry flag cleared for an ASC("0"), and set for an ASC("1"). The carry is then shifted into the integer accumulator, and this loop is repeated for each binary digit. Finally the stack is cleared, and the accumulator is loaded with zero, indicating that the result of the expression evaluation was an integer, before returning to Basic. If a '£' is detected, the expression following is evaluated by calling the Basic ROM's expression evaluator. If the result is real, it is converted into an integer. The binary representation is now formed by saving an ASC("0"), or ASC("1"), in the string accumulator for each of the 32 bits in the accumulator. Any leading zeros are then removed, a special check being made for an integer value of zero. Lastly, the length of the string is stored in zero page, before loading the accumulator with the code for a string result and returning to Basic.

£5

ATOM TIPS

When the BBC switched off the national 405-line television service a few years ago, (younger readers may consult their parents at this point), one of the reasons given for discontinuing the service was that a transmitter in Humberside had been out of action for three months, and they hadn't received a single complaint! When the Archimedes was listed on the cover of *Acorn User*, something had to give – but did anyone notice? Martin Coffey may now make computer history by being the author of the last hint ever published for the Acorn Atom.

Martin points out that CTRL-B, CTRL-C, CTRL-F and CTRL-U are often used within filenames in commercial software. This makes cataloguing the files difficult. The following short routine disables the effects of these codes, and allows you to see a normal catalogue of printable characters only. The program can be assembled anywhere safe; just change the value of P, and the last four digits in the number #FE94xxxx.

To disable the control codes, just enter and run the listing below:

```
   10 REM Kill control c
odes BCFU
   20 REM by Martin Coff
ey
   30 REM for Atom ONLY
   40 REM (c) Acorn User
 Jan 88
   50 :
   60 P=#8200;[
   70 PHP;PHA;CLD;STY #E
5;STX #E4
   80 JSR #FCF2;PLA;LDX
#E4;LDY #E5
   90 PLP;RTS;]
  100 !#208=#FE948200
```

£5

ANOTHER WAY OF DECLARING VARIABLES

Dave Instone has been converting some Commodore Basic programs to run on the BBC micro. This Basic, like may others, doesn't require you to initialise variables before use. The first time you try, say, to PRINT X, a value of zero is automatically assigned. Strings are automatically initialised with a null string. BBC Basic does require initialisation otherwise you get a 'no such variable' error. Dave has been experimenting, and has found a method slightly shorter on space if, say, you are initalising a couple of dozen variables. Instead of using:

```
A=O:BB%=O:C=O:D=O:E=O
:A$="":B$=""
```

use the following:

```
DEFPROCdeclare(A,BB%)
LOCAL C,D,E,A$,B$
ENDPROC
```

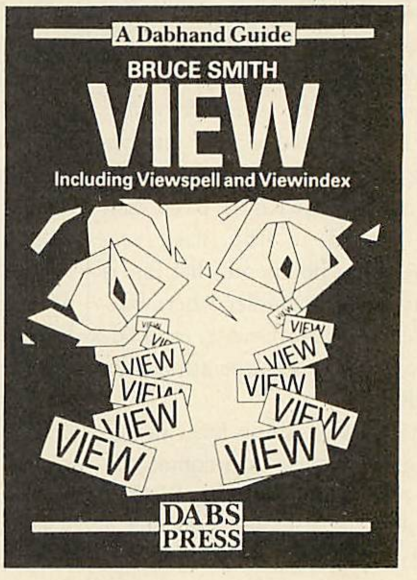
and invoke PROCdeclare – or in this case PROCdeclare(0,0) – at the start of your own program.

This works because when BBC Basic creates a local variable for which there is no global equivalent, a global version of the variable is also created and set to zero or a null string. It doesn't make any difference if the variable is declared in a local statement or as part of the procedure parameter block, both work.

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WORDWISE LINE NUMBER REMOVAL

In November 1987, we published a *Wordwise Plus* segment program to remove line numbers from Basic programs. Grahame Ward of Glasgow has written a neater way of doing the same thing. *SPOOL the program to disc and load it into *Wordwise Plus* in the normal way. Then using menu option 5 'Search and Replace' enter:

```
#|R#####
```

as the search string, and:

```
|R
```

as the replace string. All the line numbers will be removed. The command replaces Return and the first five characters of the next line with Return. The extra # before the Return removes the '¦' character which appears before the Return on each line of a spool file. These were line feeds (ASCII 10) in the original file, but *Wordwise Plus* doesn't recognise ASCII 10 and converts it, like any other character it doesn't recognise, into a '¦'. As before, you convert the edited program back to line-numbered Basic by placing the command AUTO on a line of its own at the top of the file. Then save the file in the normal way and then *EXECing it from Basic.

£10

SOFTWARE AUTO-FIRE

Mark de Weger has sent an excellent program for all you games fans – a software auto-fire button! Run the listing on this page which saves a file called CHEAT to disc. Then type * CHEAT before loading your game. Tape users will need to save the program on a separate tape, and type * RUN CHEAT, which loads and executes this program, before loading the game tape. The program is disabled by pressing Break, so a disc which normally needs Shift-Break will have to be started by typing * EXEC !BOOT instead.

The program works by intercepting Osbyte &81, which checks for negative INKEY. If Return is pressed, then the program is activated. It works by making the response to the call intermittent; ie, one call shows the key to be pressed, the next shows it not to be, irrespective of whether its pressed or not. A simple but neat idea! The variable 'key' should be set according to which key is 'fire' in the game.

Mark says that the program works with most games: 'Try it with *Rocket Raid* for a stunning effect. But it's even better with *Planetoid* – I doubled my high score the first time I played. Just a quick *CHEAT and those poor landers, pods and other meanies were killed at a fantastic rate.'

Mark has also sent a few other tips. An old chestnut, but well worth repeating, is that * FX 5,0 will turn off the printer during program testing or wordprocessor output checking. There's a hundred other reasons why you might not want the printer to be on, but don't want to alter your program. *FX 5,1 turns it on again, or *FX 5,2 for serial printers.

Two more technical tips for assembler programmers – when using Osbyte &80 to read a buffer status from within an event routine, perform an SEI before making the call, and obviously a CLI afterwards. A printer buffer is a typical example.

For ROM writers – when service call &03 (auto-boot) is issued by the MOS to each ROM, interrupts are disabled. If your routine does anything for more than a millisecond or so, you should issue a CLI to re-enable them.

```
   10 REM Auto-fire
   20 REM By Mark de Weg
er
   30 REM For BBC B/B+/M
/C/E
   40 REM (C) Acorn User
 January 1988
   50 :
   60 DIM buffer 255
   70 key=&B6
   80 code%=&900
   90 bytev=&20A
  100 osbyte=!bytev AND
&FFFF
  110 FOR pass=0 TO 2 ST
EP 2
  120 P%=code%
  130 [OPT pass
  140 LDA #entry MOD 256
  150 STA bytev
  160 LDA #entry DIV 256
  170 STA bytev+1
  180 LDA #0
  190 STA flag
  200 .entry
  210 PHA
  220 CMP #&81
  230 BNE out
  240 CPX #key
  250 BNE out
  260 CPY #&FF
  270 BNE out
  280 JSR osbyte
  290 BCC out2
  300 LDA flag
  310 EOR #1
```

Continued ▶

```
  320 STA flag
  330 BEQ out2
  340 PLA
  350 LDX #&FF
  360 LDY' #&FF
  370 RTS
  380 .out
  390 PLA
  400 JMP osbyte
  410 .out2
  420 PLA
  430 LDX #0
  440 LDY #0
  450 RTS
  460 .flag
  470 ]
  480 NEXT
  490 :
  500 X%=buffer MOD 256
  510 Y%=buffer DIV 256
  520 $buffer="SAVE CHEA
T "+STR$~code%+" "+STR$~
P%
  530 PRINT $buffer
  540 PRINT "Press SPACE
 to save the machine cod
e"
  550 REPEAT UNTIL GET=3
2
  560 CALL &FFF7
  570 PRINT '"Code saved
 as file 'CHEAT'."
  580 PRINT "Use *CHEAT
or */CHEAT before loadin
g games"
  590 END
```

The Auto-fire program

YOUR IDEAS WANTED

The time has come once again to ask for some more contributions. Ever since the Archimedes appeared, the flow of ideas sent to Forum has become a torrent! Short ARM programs are now very welcome, as are new and interesting things for the BBC micro. However, we have enough fast back-up and CMOS RAM utilities to last a lifetime – no more of those please. A tip is more likely to be included if it works on all BBCs, rather than just the Master series. A lot of the material submitted is unsuitable for reasons other than quality, so for medium-sized items, an enquiry letter is quite in order. Programs should be submitted in *AU* format, the most important feature of which is to put only one statement per line. Remember also to include both text and program on disc – any format except double-density DFS – and a stamp guarantees you an answer. Send them to Forum, *Acorn User*, 20-26 Brunswick Place, London N1 6DJ.

1

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Additional charges for discs		£9.00 (d)
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APPLICATIONS
Interfacing Proj for BBC £6.95
BBC and Small Business £5.75
The Software Business £5.50

Mastering Operating System (David Atherton) £12.95

WYSIWYG PLUS

WYSIWYG PLUS is a printer and screen utility for Wordwise Plus, View, Interword, and Basic users, supplied on a 16K Eprom. To obtain a particular printer effect, such as enlarged text, it used to be necessary to discover the appropriate 'printer control code' from your manual and incorporate it into your text. Secondly, you had to print several trial copies in order to position the effect correctly in relation to the rest of your text.

WYSIWYG PLUS simplifies this trial and error approach using easily remembered *commands. For example, *ENLARGED not only selects enlarged text on your printer, but uniquely shows you double width characters on your screen, even from within Wordwise Plus!

WYSIWYG PLUS incorporates a logo editor. Just draw your design on screen using the arrow keys, and save the results. Use the *GRAPHICS command to incorporate your design anywhere in your text; position and see your design in your text before faithfully reproducing a hard copy.

There is also special help for daisy wheel users. The *WHEEL command will prompt you to change daisy wheels whenever a change in type style is about to occur.

WYSIWYG PLUS is designed to work with the following systems:

BBC Model B
BBC Model B+
BBC Master 128
BBC Compact
6502 Second processor,
Turbo coprocessor
All printers (Except lasers)

WYSIWYG PLUS workspace is relocatable.

WINDOWMATIC

All users of Acorn's VIEWSHEET speadsheet program will be aware of its powerful windowing facility which allows the screen and/or printer to be configured in up to 10 seperate windows taken from anywhere in the sheet. They will also be painfully aware of how difficult and time consuming it is to set up a required display. Although VIEWSHEET allows configurations to be saved to the media, it does not have provision for deciphering them.

WINDOWMATIC has been produced with the intention of rectifying these shortcomings and to bring out the very best from VIEWSHEET.

WINDOWMATIC provides a quick and easy way to configure screen and printer allowing complicated documents and reports to be set up much more easily. It displays complete text information on all 20 windows and accurate graphic representation of the screen and printer output.

The package includes a screen dump routine for Epson printers and allows use of other printer dump packages.

WINDOWMATIC is compatible with BBC Master and BBC B+. A 6502 2nd processor must be fitted to a model B to run Windowmatic. Windowmatic is fully compatible with Turbo and 6502 2nd processor.

The program is supplied on disc with a comprehensive manual.

VU-TYPE

Do you have finger trouble when typing?
Do your letters look like this?
Dear Sor,
I wuold like to .....
then you need:
VU-type, a complete touch typing program produced by BBC/Pitman.
It allows you to learn at your own pace and has a wide range of exercises. Screen displays show the keys you have pressed and it will report on your speed and accuracy.
Supplied on a 40T Disc with a manual.
Available at a special price of £7.50(d) instead of the usual £15. Offer valid while stocks last

EDUCATIONAL/FUN SOFTWARE BUNDLE

Wordmover
Wordplay
Pantry Antics
Drawstick
Locomotion

These programs are supplied from the BBC Publications Educational Software range and will be supplied on a 5.25" disc for BBC Master, B+ and B and on a 3.5" disc for the Compact.

5.25" Disc £17.50(d)
3.5" Disc £18.50(d)
(Normal RRP over £40)

PRINTER ACCESSORIES

EPSON ACCESSORIES:
Interfaces
8143 RS232 .... £30 (d)
8148 + RS232 + 8k .... £65 (d)
8177P NLQ for FX80 +/FX100 + .. £99 (d)
Parallel & Serial Buffers of various size also available.
LQ800 Tractor Feed .... £47 (b)
LQ1000 Tractor Feed .... £52 (b)
SHEET FEEDERS:
LQ800 .... £135 (b)
LQ1000 .... £179 (b)
EX800 .... £135 (b)
EX1000 .... £309 (b)
FX800 .... £135 (b)
FX1000 .... £179 (b)
Ribbons:
RX/FX100/100 +, FX105 .... £7 (d)
RX/FX80/80 +, FX85 .... £4 (d)
LX80/LX800 .... £4.50 (d)
LQ800 .... £8.50 (d)
LQ1000 .... £10 (d)
EX800/1000 .... £7.50 (d)
H180 Pen Set (Aqueous/Ball point) .... £8.25 (d)

HITACHI 672 Plotter
Aqueous Pen Set six pens .... £18.50 (d)
Oil Based Pen Set six pens ... £25.00 (d)

TAXAN CANON Accessories:
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Star Printer
NL10 Sheet Feeder .... £52 (b)
NL10 Ribbon .... £4.50 (d)

National Panasonic KX P1080/81
Spare Ribbon .... £4.50 (d)
KXP3131 Tractor .... £90 (a)
KXP3131 Sheet Feeder .... £189 (a)

JUKI 6100
Tractor Feed .... £149 (a)
Ribbon (Carbon) .... £2.00 (d)
Sheet Feeder .... £219 (a)

BROTHER HR20
Tractor Feed .... £116 (a)
Spare Ribbon Nylon .... £3.00 (d)
Spare Ribbon Carbon .... £4.50(d)

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NOVACAD

Computer Aided Draughting for the BBC Micro

" *Novacad can drive a plotter to provide drawings of a high quality... Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use.* " **Beebug December 1986**

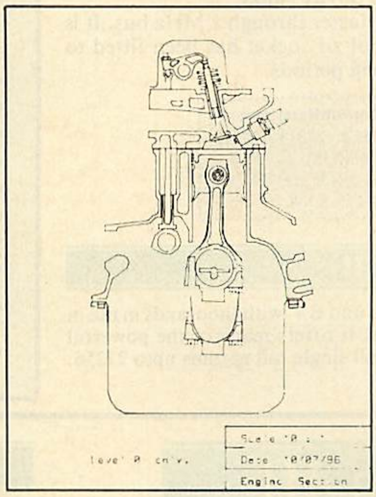
" *Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market".* " **A&B Computing August 1986**

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

NOVACAD'S MAJOR FEATURES

* Simple and easy to use with logical command sequence.
* A large drawing area (approx 15 screens).
* The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
* A zoom facility allowing magnification of up to 20 times to insert finer details.
* Block copy of shapes on the screen for repetitive use.
* Text entry at any 90° orientation at any position on the screen.
* Create multi layer drawing with 8 levels available.
* Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
* Printer routine for Epson 80 and 136 column printers.
* A unique optional facility to output to any BBC compatible plotter.
* Cursor control from keyboard, tracker ball or mouse.



NOVACAD is compatible with all BBC models fitted with Acorn DFS. It has minimum hardware requirements of a single drive and a Epson compatible printer to get started though NOVACAD will utilise fully a dual drive system and 6502 2nd processor or the shadow ram on the B+ series. To obtain high quality drawings we recommend a BBC compatible plotter and our plotter driver generator.

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC+ or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

NEW REDUCED PRICE

£49(d)

Plotter Driver Generator £15(d)

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

BBC SPARE PARTS

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Keyboard Connector	£5.00 (d)
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Keyswitch (state type)	£1.75 (d)
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68B54	£8.00 (d)
75159	£2.20 (d)
76489	£4.00 (d)

BBC B +

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B+ OS	£18.00 (d)
4864-12	£3.00 (d)
PAL16RH	£18.00 (d)
1770 DFS ROM	£17.50 (d)

BBC MASTER

Power Supply	£65.00 (b)
Keyboard Connection	£3.75 (d)
Keyboard	£65.00 (b)
Keyswitch (state type)	£1.75 (d)
1 Mb OS ROM	£39.00 (d)
CF30060 ULA	£10.00 (d)
CF30047 ULA	£15.25 (d)
CF30048 ULA	£15.25 (d)
CF30049 ULA	£15.25 (d)
CF30050 ULA	£19.75 (d)
CF30058 ULA	£15.00 (d)
6818	£4.00 (d)
65SC12	£15.66 (d)
50464	£3.50 (d)
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74F74	£1.40 (d)
74HCT253	£3.50 (d)
9637	£2.00 (d)
32.768 MHz Xtal	£2.00 (d)

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ULA (512)	£34.00 (d)
ULA (6502 & Z80)	£28.00 (d)
Power Supply	£42.00 (b)

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EpromRyter

***Highly sophisticated & Advanced Programmer**

***Handles all current single rail Eproms**

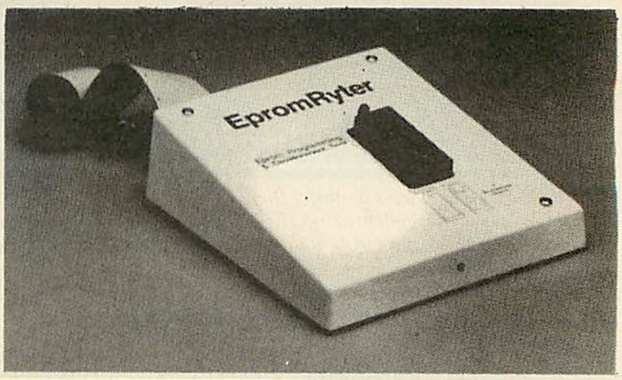
***State of the Art Programming Algorithms**

EpromRyter is a powerful eprom programmer designed for use with the BBC Master Computer. It takes full advantage of the latest developments in the eprom technology and the extra facilities on the Master to provide fast, simple and efficient programming and editing facilities.

The software is totally menu driven and on screen help messages make the programming simple for both specialists and novices alike.

The EPROMRYTER interfaces with the Master through 1 MHz bus. It is mains powered with its own psu. 3M Textool zif socket has been fitted to ensure consistent and reliable service over long periods.

The single rail eproms handled by the EpromRyter are:
- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA



The main features of the programming software are:
- * Device, function and voltage selection from the computer keyboard.
- * Continuous display of the options selected.
- * All eproms upto 27512 (64K) programmed in single pass.
- * Automatic Intelligent identifier support for eproms able to respond.
- * Selectable programming voltage 25/21/12.5V
- * 3 programming methods: Normal, Intelligent & Pulse (30 sec for a 27128).
- * Serial port protocols supported incl Intel Hex & Motorola S.
- * DFS, NFS, ADFS and Rom Filing System Supported.
- * BASIC/Machine Code programming using RFS.
- * Powerful editor with input in HEX or ASCII. * Full editable 64K file.
- * Block move of data within the address range.
- * User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
- * Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EPROMER II

A proven Eprom programmer for BBC Model B and B+ with thousands in use in industry, educational and R&D establishments. It offers many of the powerful features of the EpromRyter and can program all single rail eproms upto 27256. Full details on request.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach." **Acorn User October 1986**

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc):
- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

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Complies with BS6192 for PASCAL — **£99 (c)**

ANSI C* SKL28
Complies with ANSI draft for C — **£99 (c)**

FORTRAN 77* SKL48
Complies with ANSI X3.9 — **£99 (c)**

**These are prerelease versions which will be updated foc*

TWIN
A comprehensive editor for the above languages — **£29 (c)**
Prerelease version

PROLOG SKL68
A language for Artificial Intelligence software developers — **£199 (b)**

LISP SKL14
A AI language — **£199 (b)**

COMAL SKM19
A general purpose language which encourages well structured programming and facilitate debugging and maintenance of software. It has been adapted to run under 6502 emulator — **POA**

SOFTWARE DEVELOPERS TOOLBOX SKL58
A collection of essential utilities such as Diffs (allows text and binary file compare), Twin and Assembler for advanced programming on the Archimedes. Also included are Software Developer's Debug Tool and Linker for linking compiled programs. — **POA**

SOFTWARE DEVELOPER'S DEBUG TOOL SKL68
A debugging tool for C, Pascal and Fortran at the source code level. It provides a common format across the three languages for trace and fault diagnosis — **POA**

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They have separate keyboard and a three button mouse as standard. The Keyboard is compatible with the new IBM ATE layout, with 12 function keys.

The standard display is a high resolution mono colour monitor. A colour, multifrequency monitor is optional.

The screen modes include:

- 80 × 25 or 32 characters, in 2, 4 or 16 colours for wordprocessing, etc.
- 132 × 25 or 32 characters, for spreadsheets, etc.
- Up to 640 × 256 dots × 256 colours (with single frequency monitor) and up to 640 × 512 dots × 16 colours (with a multi frequency monitor), for graphics, etc.

The sound system can have upto eight channels playing at once, from up to 32 instruments or voices, using waveform synthesis and stereo output.

The outlets for the monitor, printer, serial port and audio are all at the rear, and have industry standard connectors.

The 410 and 440 have a backplane for four expansion podules and the circuitry for a Winchester disc drive as standard.

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What Archimedes does and can do

The software on the welcome disc includes four applications.

"PAINT" is a simple mouse driven art package, operating in the 640 × 250 × 16 colour screen mode. Images can be produced without any programming and saved to disc for use elsewhere.

The sprite editor allows sprites to be created pixel by pixel in the 640 × 256 × 16 and 256 colour screen modes. It can also be used to edit pictures from "Paint". The results can be used in Basic programs for animated graphics.

The Font Designer allows you to design individual letters and symbols – and save them together as a font". They may be "anti-aliased", for even better appearance on screen.

The Music Editor allows you to enter music in standard notations, with upto four "parts", and save it to disc. It may be played via the internal speaker (in mono) or via external headphones or hi-fi (in stereo). The voices or instruments (or which there are nine as standard), and their volume, tempo and stereo position may all be varied while playing.

BBC Basic 5

This is upwards compatible with earlier versions, so most programs written in them will run – though far faster. Even using a 305, upto 370K is available in Basic. It also affords access to all the new graphics, windowing and sound facilities – as shown by the applications on the welcome disc. As well as being in the system ROM, BBC Basic 5 is provided on Disc for loading into RAM because it then runs about 40% faster. This speed makes it the FASTEST MICRO IN THE WORLD".

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PC EMULATION

The Acorn PC Emulator (for 310, 410 & 440), includes MS-DOS 3.21 and is available NOW at £99. It runs most MSDOS and many PC-DOS applications (which number over 10,000). Compared with IBM PC, this all-software emulator can calculate about half as fast, and write to the screen about a quarter as fast. This makes it more suitable for running spreadsheets (such as Lotus 1-2-3) than wordprocessors (such as Wordstar). However it includes utilities for copying disc files between DOS and ADFS formats, so that data may be transferred to and from Archimedes applications. The 3.5" discs used by the new IBM PS/2 models, and by many DOS portables, may be read, written and formatted directly. 5.25" discs require an additional, external drive, which is available as an option. The PC Podule (due second quarter '88), will run very much faster.

LANGUAGES

Acornsoft ANSI "C", ISO-Pascal, Fortran 77, Cambridge LISP and PROLOG X are all available now at £97 each, as is the Twin Editor, at £29. These require at least a 310. The ANSI "C" affords access to all the graphics, windowing and sound facilities of the Archimedes and execute at exceptional speed – 14 to 26 times that of a PC, 5 to 10 times that of an AT, and as fast as most 386 machines.
(For demonstration, call in at our retail shop. If you require technical literature, then simply telephone us).

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with two disks, one 5.25" for the BBC, the other 3.5" format for the Archimedes, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. Upto FOUR drives can be connected and NO SOLDERING is involved. Supplied complete with necessary lead.

Only £25

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Archimedes.

BBC MASTER

BBC MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMULATOR **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

*Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and **Watford's 3½"**, double sided 1 Megabyte (unformated) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

BBC MASTER with Turbo Board + above SPECIAL OFFER **£475**

512K Processor Add on Board "inc. Mouse and GEM package" **£185**

BBC AIV (Domesday) System **£4479**

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module	£95
Econet Module for the Master	£40
Twin ROM Cartridge for Master	£7.50
Quad ROM Cartridge for Master	£12
Universal Processor Adaptor	£75
Reference Manual I (No VAT)	£14
Reference Manual II (No VAT)	£14
Advance Ref. Manual (No VAT)	£19
64K Upgrade Kit for B+	£32
Acorn 1770 DFS Kit complete	£41
ECONET Upgrade Kit for BBC	£42
ALL ECONET UPGRADES Available	
Z80 Acorn 2nd Processor package	£325
ARIES' Professional IEEE Interface	£238
Acorn IEEE Interface Complete	£265
Morley Teletext Adaptor with ATS Rom	£99

BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled software.

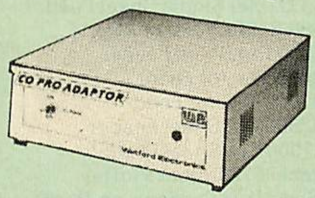
System 1	Standard Package	£310
System 1A	System 1 + TV Modulator	£322
System 2	System 1 + Green Hires Monitor	£364
System 3	System 1 + Medium Res Colour Monitor	£478
RS232 Kit for BBC Compact		£25
Additional 3½" Drive for BBC Compact (Securicor carriage £7)		£90

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

£259

CO-PRO Adaptor



Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.
Master owners may use Co-Pro to add a second Co-processor externally.
Watford, brings power to your BBC at only:

£35.00 (carr £5)

MEGABUFFER 256



This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £125 (carr. £3)

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B.

£135



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. **All Monitors are supplied complete with BBC connecting leads FREE.**

MICROVITEC 14"

1431 – Medium resolution as used on the BBC television computer programme	£175
1451 – High resolution, suitable for word processing in mode 0	£225
1441 – High res, exceeds the capabilities of the BBC micro	£359
1431AP RGB + PAL and AUDIO	£199
1451AP RGB + PAL and AUDIO	£255
2030 CS 20" Med Res	**£380**
204 CS 20" Hi Res	**£675**
Dust Cover for Microvitecs	£5.50
Touchtec 501 Touch Screen	£239

XMAS OFFER

This month, we are giving away absolutely FREE, our 14" Swivel Base unit, with every 14" Microvitec Monitor purchased from us.

KAGA-TAXAN 12"

TAXAN KX117 Hi-res Green Monitor	£75
TAXAN KX118 Long persistence Hi-Res Green Monitor	£80
TAXAN KX119 Ultra-Hi-Res Amber Monitor	£85
TAXAN Super Vision 2 **Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing	£269
TAXAN Super 3, Type 625 Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue	£319

STAR BUY

- PHILIPS 14 Hi-Res. dark glass, attractively finished Colour Monitor – supplied complete with RGB. SKART and Audio. Phono connectors. A push button switch toggles between Hi Res monochrome green test mode and full colour display

ONLY £209

SWIVEL BASES FOR MONITORS

Please see Page 4 of advert

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res	£69
Amber (New Design) Hi-res	£74

LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for KAGA	£3

N.B. carriage on Monitors **£7** (securicor)

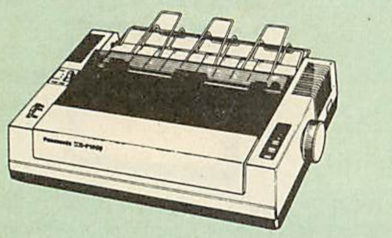
Continued

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users.

£12

Panasonic KX-P1081



Available NOW at a superbly realistic price, the KX-P1081 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy **120 cps** of clear Draft text backs up the crisp 24 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters and IBM special characters as well as IBM block graphics characters. A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £6)

Panasonic KX-P1082

To complement the hugely popular Panasonic KX-P1081, Watford Electronics are proud to announce the launch of Panasonic KX-P1082. This superb letter quality printer has all the features of the KX-P1081, plus a draft speed of 160 cps, making it ideal for high through-put users. This is a similar speed to the Epson EX800, but has an adjustable tractor feed built in and all the incredible facilities of the KX1081, such as variable sized NLQ between 5 and 17 cpi. KX-P1082 represents truly outstanding value at only £175, way below the price of its nearest competition. The price includes the FREE Cable & Dump Out 3 AAROM.

Introductory Offer: **£175** (carr. £6)

Panasonic KX-P3131 Daisy-Wheel Printer

This low-cost high-performance Daisy Wheel printer is ideal for anyone wishing to produce clear, immaculate letters or reports. It delivers, flawless text at 10, 12 & 15 CPS. Supports proportional spacing. Is Bi-directional. logic seeking. Printing speed: 17CPS. Has 6k printer Buffer. A printer of similar spec could cost a lot more than our ridiculously low price of:

Only **£239** (carr. £7)

Single Sheet Feeder	£175
Tractor Feed	£90
Spare Ribbon	£3.00

VARIOUS PRINTERS & ACCESSORIES

● Brother HR15 RS232 Daisy Wheel	**£275**
● Brother HR20 Daisy Wheel	**£349**
● Epson EX800 Printer	**£399**
● Epson EX1000 Printer	**£545**
● Epson FX800 Printer	**£295**
● Epson FX1000 Printer	**£405**
● Epson LQ800 Printer	**£390**
● Epson LQ1000 Printer	**£529**
● Epson LQ2500 Printer	**£790**
● Epson LX800 Printer	**£180**
● Epson SQ2500 Printer	**£899**
● Epson Paper Roll Holder	**£17**
● EX800/1000 Colour Option	**£55**
● EX800/1000 Colour Ribbon	**£18**
● EX800 Cut Sheet Feeder	**£130**
● EX1000 Cut Sheet Feeder	£195
● FX/LQ/LX800 Single Sheet Feeder	**£135**
● FX/LQ1000 Single Sheet Feeder	**£169**
● Hi-80 Refills – Set of 4 Pens	**£7**
● LX800 Cut Sheet Feeder	**£75**
● LQ800 Tractor Feed	**£44**
● LQ1000 Tractor Feed	**£50**
● LQ2500 Cut Sheet Feeder	**£195**
● LX1000 Cut Sheet Feeder	**£305**
● **Hitachi 672 Colour Plotter**	**£495**

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	**£27**	RS232 + 2K Buffer	**£55**
IEEE 488	**£65**	RS232 + 8K Buffer	**£75**

KAGA/TAXAN PRINTERS

(IBM/Epson compatibles)

Kaga KP815 Printer	**£269** (carr £7)
Kaga KP915 Printer	**£350** (carr £7)
RS232 Interface	**£49**
RS232 Interface with 2K Buffer	**£69**
RS232 Interface with 16K Buffer	**£89**

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, Panasonic etc. printers.

Standard length (4 feet long)	**£6**
Extra long (6 feet long)	**£8**
Compact's Special Centronics Lead	**£9**
RS232 Cable	**P.O.A.**
IBM Parallel 1 metre Cable	**£9**

PRINTER SHARERS

(Ideal for School environment)

Connects	Serial	Centronics
2 BBC Micros to 1 Printer	£26	£25
3 BBC Micros to 1 Printer	£36	£35
6 BBC Micros to 1 Printer	–	£99

PRINTER CHANGER

3 Printers to 1 Micro (Centronics) **£65**

(Cables extra, specify type required when ordering)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

£26

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in *the example* programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £3.00
27128-250nS £3.50

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £2.50
2 × 6264LP (16K) £4.80

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	**£3.50**
BBC Master	–	**£4.00**
Brother HR15/20	**£3.00**	**£5.00**
EX/LQ800	**£7.50**	**£4.50**
EX/LQ1000	**£8.00**	**£5.00**
FX80/85/800/MX80	**£4.00**	**£4.95**
FX100/1000	**£7.00**	–
Kage/Texan KP810/815	**£5.25**	**£4.00**
LQ2500	**£9.00**	**£5.50**
LX80/86/800	**£4.00**	**£4.50**
M1009/GLP	**£4.00**	**£3.00**
Panasonic KX1080/81	**£4.50**	**£4.75**
SQ2500	**£25.00**	**£5.50**
Star NL10	**£4.00**	**£4.50**
Microvitec Metal	–	**£5.50**

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	**£7**
2,000 Sheets 9½" × 11" Fanfold Paper	**£12**
1,000 Sheets 15" × 11" Fanfold Paper	**£9**
1000 Sheets true A4 Fanfold Paper	**£11**
2000 Sheets true A4 Fanfold Paper	**£20**
Teleprinter Roll (Econo paper)	**£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	**£5.00**
1,000 90 × 36mm (Twin Row)	**£4.90**
1,000 90 × 49mm (Twin Row)	**£7.50**
1,000 102 × 36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

All prices in this advert include VAT

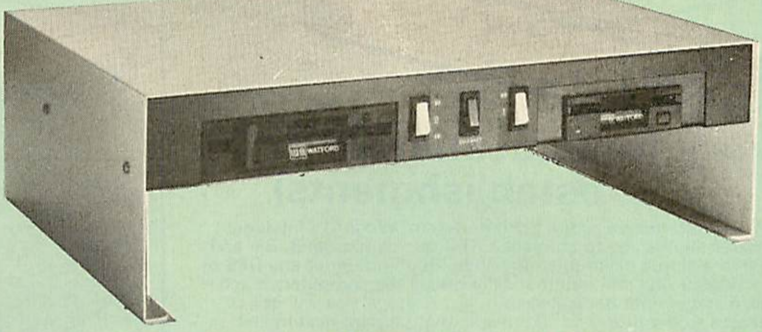
SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress. Front adjustable without lifting the monitor. (See drawing on left).

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

NEW LAUNCH OFFERS
Type DP35-800S



In response to customer demand, Watford Electronics have released this new combined 3½" & 5¼", twin, double sided 800K, Disc Drive unit. The drives are mounted in a sturdy BBC Master Plinth unit, attractively finished in BBC beige. They are powered from an in-built power supply unit. The 5¼" Drive is 40/80 track switchable. With this unit, users can transfer data between different BBC machines very easily. Supplied complete with Cables and a utilities disc.

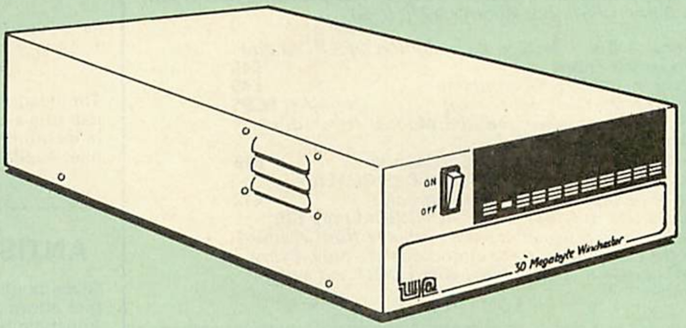
Launch Offer: **£165** (Securicor carr. £7)

CSPM 400/S DISC DRIVE

A single (1 Megabyte unformatted), double sided, 40/80 track switchable 5¼" disc drive mounted in a BBC Master Plinth (same as DP35-800S) but with a blanking plate to add a second disc drive at a later date. The in-built Power Supply is capable of running two disc drives. The unit is supplied complete with cables and a utilities disc.

Launch Offer: **£139** (carr. £7)

30Megabyte Winchester Drive

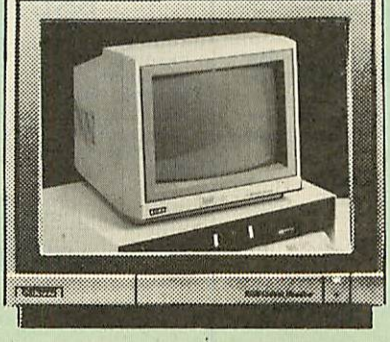


Watford Electronics 30Megabyte Winchester Drive

This completely new Hard Disk Drive, designed using the latest technology, is offered at a previously unthinkable price for such a high capacity drive. Just compare the price with our competitors' 20 or 28Mbyte Hard Disks.
Attractively finished in BBC beige the drive is supplied complete with Acorn ADFS ROM, a full user guide and format, copy and high density 1000K per disk archive utilities.

Special Launch/Xmas Offer **£449.00** (Carr. £12)

Phillips 12" PAPER WHITE Monitor Type BM7542

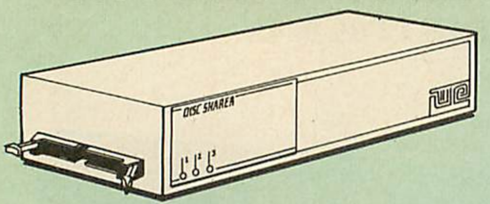


This attractively finished high resolution Phillips monitor, incorporates an anti-glare screen and tilt stand, making it ideal for both word processing and graphics. The paper white display is especially suitable for desktop publishing and CAD packages. It also has a Video/Audio input.

Only: **£75** (carr. £7)

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not compatible with ADFS.)

Launch Price: **£59** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities then simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for five years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS). (not Acorn's 1770 DFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£46**
- *Acorn's 0.90 DFS Kit complete* **£45**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

NEW

WATFORD's Mk II Double Density DFS INTERFACE

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our MkII DDFS board has been adapted to allow the use of Acorn ADFS.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

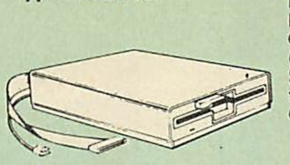
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£25.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

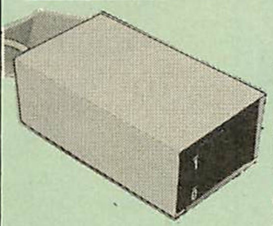
SPECIAL DISC DRIVE/DDFS OFFER

Type CLS400



- The popular Mitsubishi 400k Single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's popular DDFS Disc Interface (allows 720k storage). Will run in both Single and Double Density modes 40/80 track Software switchable.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
(Offer valid while stocks last)



3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- Single 400K Drive **£69**
- Twin 800K Drives **£126**

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

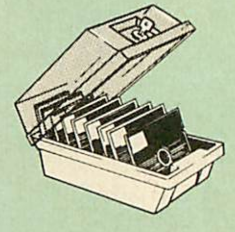
The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

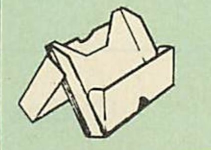
£7

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25** – holds upto 25 3 ½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**





PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**



DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

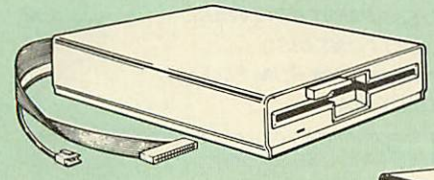
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

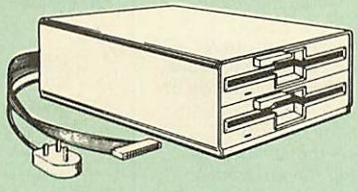
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 6th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £89	CLD 400 £168	CS 400S £99	CD400 £188
800K (1.44M)		CLD 800S £169		CD 800S £188

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5¼" S/S D/D 40 Track Diskettes* ***£8.25***
- *10 × 5¼" D/S D/D 40 Track Diskettes* ***£10.20***
- *10 × 5¼" S/S D/D 80 Track Diskettes* ***£12.75***
- *10 × 5¼" D/S D/D 80 Track Diskettes* ***£13***
- *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* ***£28***
- *10 × 3½" S/S D/D 40/80 track Discs* ***£15***
- *10 × 3½" D/S D/D 40/80 track Discs* ***£19.50***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × **M3** 3½" D/S D/D 80 Track Discs* ***£18***
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* ***£6.50***
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* ***£8***
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* ***£9***
- *3" Double Sided Discs* ***£3 each***

Special BULK OFFER on 5¼" DISCS

PRICES SLASHED

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48

ACORN WINCHESTER DRIVES

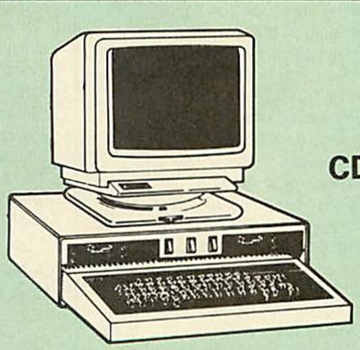
FILESTORE E01	£825
FILESTORE E20	£705
Acorn 30MB Unit incl. Level III Software	£1520

WATFORD's WINCHESTER DRIVES

PRICES SLASHED

- 10 Megabyte Unit with ADFS **£399**
- 20 Megabyte Unit with ADFS **£499**
- 30 Megabyte Unit with ADFS **£449**
- 40 Megabyte Unit with ADFS **£749**

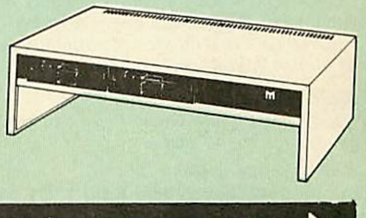
CDP800S **CDPM800S**



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £198
CDPM 800S for Master £199
(Securicor Carr. £7)
(The above drive units are 2 Megabytes unformatted)

ACORN'S Twin 800K Disc Drives



Specially mounted side by side in a Master Plinth. Supplied complete with Cables. Plugs directly to the Master Computer.
RRP £350
Our Price: Only £189
(carr £7)

Continued →

NOMINATED FOR MICRO COMPUTING BRITISH AWARDS 1987

QUEST MOUSE

QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and is smooth and easy to use on most work surfaces. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87

"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."

"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87

"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87

". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package. . ".

". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro . . ."

"Quest Paint is a major leap forward in BBC programming. . ."

"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87

"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."

". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".

"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".

"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".

"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".

"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".

"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."

"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".

"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:

"Quest has been an excellent piece of equipment, far superior to the AMX mouse that we have been using for the past 12 months. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Beeblet User Group, New Zealand Oct '87:

"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	**£59**
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	**£85**
QUEST MOUSE ONLY	**£29**
QUEST PAINT SOFTWARE	**£32**
QUEST FONT DISC	**£12**
ConQuest 32K ROM Package	**£29**
QUEST MAT	**£3**
Part-exchange your old Mouse for a New QUEST MOUSE for only	**£23**

N.B.

1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.

2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN + PENPAL 2

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

With every lightpen, we supply our sophisticated Penpal 2, lightpen software (Disc) FREE.

Price Only £19

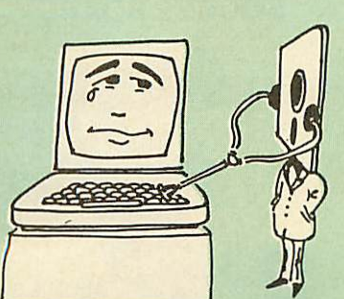
RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	**£59**
RB2 including Quest Paint	**£85**

FLEET STREET EDITOR

Software pack for BBC Micro	**£31**
Software pack for the Master	**£39**
Software Pack for Compact	**£40**
Admin Xtra Disc Utility	**£13**
Walt Disney Disc Utility	**£13**
Fonts N Graphics Disc Utility	**£13**

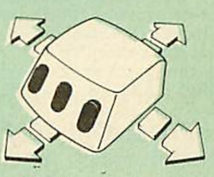
DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

THE AMX MOUSE



ONLY: £59 **Inc. Super Art package**
(carr £1.50)
(Please specify for BBC or Master Computer)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

AMX MAT	£3
AMX MOUSE ONLY	£29
AMX DESK Package	£19.00
AMX UTILITY Package	£11.00
AMX SUPERART Package	£39
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-GONTS disc with every purchase of STOP PRESS from us.

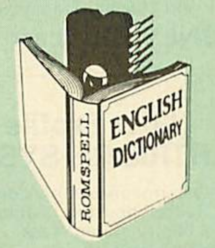
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£9.50
AMX DESIGN (ROM)	£59
AMX 3D ZICON Disc	£19
AMX Database Disc	£19
AMX Stop Press	£39
AMX XAM Educational	£15
AMX MAX A gem of desktop	£15

TED
THE ULTIMATE TELETEXT SYSTEM

TED is one of a new generation of powerful 32K ROMs for the BBC B, B+ and Master computers and is compatible with disc, tape and network systems. It is in everyday use in schools, colleges and universities, Programmers, Prestel I.P.'s, Micronetters and exhibitors have also found it indispensable.
TED includes the most comprehensive teletext (Mode 7) screen editor ever written for the BBC micro, combining flexibility with ease of use. Its sophisticated facilities include line, column and block copying within AND between frames; text, in a variety of styles and sizes, entered directly from the keyboard; graphics and line drawing modes; search and replace; margins; printer dump routines and a library of in-built icons and typefaces. TED will edit ANY mode 7 screen and can even convert high-res graphics screens to mode 7! Included within the ROM is a fully Epson compatable mode 7 graphics dump routine giving a grey scale printout of exactly what appears on the screen.
Using '*SHOW' (a versatile carousel), collections of mode 7 screens may be 'routed' or displayed sequencially, making it ideal for creating and running 'Viewdata' information systems. Over 1200 frames may bestored on a twin 80 track drive. A unique feture of TED is '*SCROLL', which lets you create pages of up to 600 lines which may be viewed 'Wordwise style', automatically or manually. SHOWs and SCROLLs may be freely mixed and even used from within a BASIC program.
The package comprises a 32K ROM, a 117 page manual, a function-key strip and a demonstration disc containing examples of real-time animation and a sample 55-frame database. A stand-alone machine code routine is provided allowing SHOWs and SCROLLs to be displayed on machines not fitted with TED.

Price: £35

ROM-SPELL

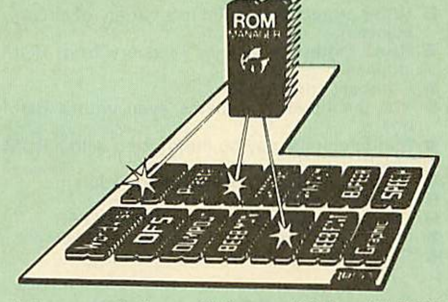


Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

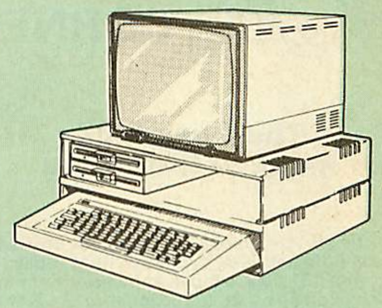
ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

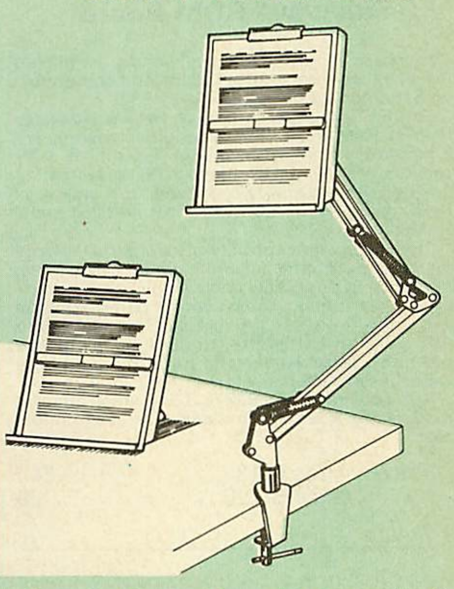
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £3.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£24** (carr £3.00)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip. Both units are full A4 size.

Amazing value at only
Desk Top **£10** (carr. £2)

Angle poise **£14** (carr. £3)

Continued →

ARIES CORNER

The Aries B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: **£80** (carr. £2

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price:	Aries B-12	£40
	Aries B-12C	£5

ARIES B-488 IEEE-488 INTERFACE UNIT

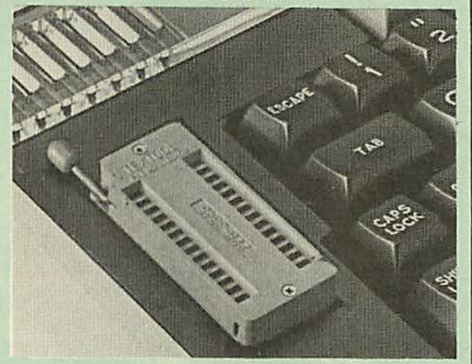
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

VISA

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

Complete System	£11
Spare Cartridges	£2.50
Spare Rack	£1.50

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

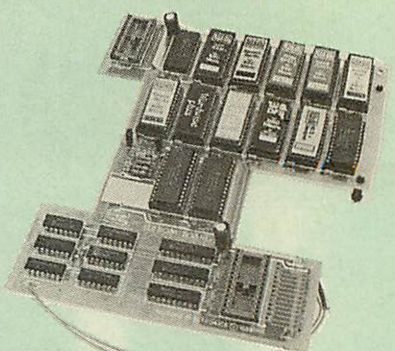
Only: **£24** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

All prices in this advert are exclusive of VAT.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

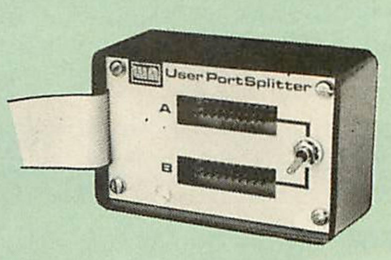
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

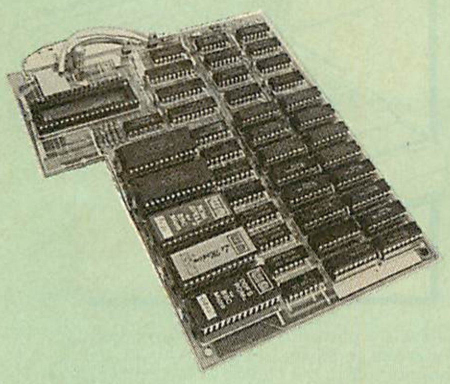
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£19**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- *ROM/RAM card with 32k dynamic RAM* ***£39***
- ROM/RAM card with 64k dynamic RAM ***£52***
- ROM/RAM card with a massive 128k dynamic RAM **£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- *16k plug-in Static RAM kit* ***£6***
- *16k Dynamic RAM for Upgrade* ***£7.50***
- *Battery backup* ***£3***
- *Read and Write protect switches* ...... ***£2 each***

Complete ROM-RAM board All options installed ***£89***

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £10 less

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£84***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£82

(Price includes: Nightingale Modem, Commstar ROM pack & Comprehensive manual)

Nightingale Modem without software **Only £75**
COMMSTAR ROM package only **£29**
(P&P on modem £3.00)

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**
- **£6.50 off annual Membership to Micronet, Prestel and Telecom Gold.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£84** **(Carr £3)**
(Write in for full specification)

Minerva Systems Software

System Delta with Card Index	**£55**
System Programmers Ref. Guide	**£19**
System Gamma	**£43**
System Gamma Prog. Ref. Guide	**£19**
System Mailshot	**£17**
System Reporter	**£17**
System Intrer/View Link	**£17**
System Sales Ledger	**£39**
System Purchase Ledger	**£39**
System Nominal Ledger	**£48**
System Stock Management	**£39**
Order Processing/Invoicing	**£39**

Versatile **BEEB SPEECH SYNTHESISER** Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £24

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £45

Inter SHEET ONLY £37

INTER-CHART ONLY: £26

Inter-WORD Only: **£39**

INTERBASE £55

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£35
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£79**
HI-VIEW (for use with 6502 2nd Processor)	£36
VIEW Printer Driver Generator Please specify Disc or Cassette)	£9
VIEWSHEET (Acornsoft)	£37
VIEWSTORE	£37
VIEWSPELL with 80 track disc	£29
VIEWPLOT Disc (Please specify for Master 128 or Compact)	£22
VIEW-INDEX	£12
OVERVIEW Packs 1 & 2 for the Master	£75

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

Micros in Business (Disc)

An introduction to Business software for the BBC Micro from Acorn £43

ADVANCE COMPUTER PRODUCTS' ROMs

Adv. Disc Toolkit	£29
Adv 1770 DFS for Mast/Compact	£29
Adv 1770 DFS for BBC/BBC+	£29
Adv Disc Investigator	£24
Adv. Control Panel	£29
Adv. Rom Manager	£13

MINI OFFICE II

Disc Version	£14.50
ROM Version	£48.00

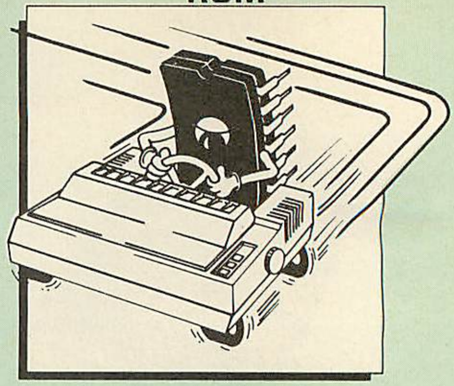
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

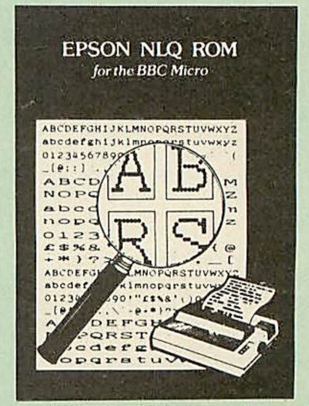
The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33



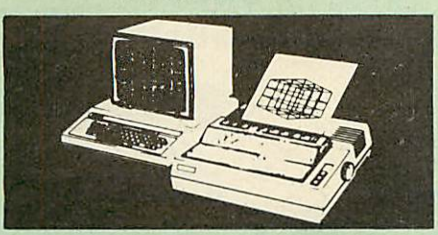
Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:
- *Vertical and horizontal scaling in all graphics modes and mode 7*
- *Rotation of image by 90, 180 or 270 degrees*
- *Left hand margin setting*
- *Screen dump window setting*
- *Colours appear as grey scale*
- *Two tone fast dump*
- *Colour mask*
- *Mode 7 contrast expansion*
- *Mode 7 contiguous dump*
- *Key triggered and User Port triggered dumps*

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:
GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally and compatibles.

Only: £25

(Write in for further details on all above ROMS)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degredation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

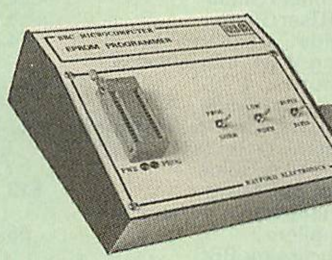
The most powerful machine code monitor for the BBC Micro **£24**.

THE NLQ DESIGNER

(The First & still the Best)
Supplied with over 25 Different fonts

A massively useful utility for users of the Taxan/Kaga KP810/910 or the Canon PW1080. This program allows you to define NLQ character sets to download into the printer's memory. Full on screen editing of the font. Requires 6264 RAM chip to be fitted in the printer.
Supplied with disc containing over 25 example fonts. Please specify 40 or 80 track. Fonts are: Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic etc. (P.S. This ROM is not suitable for Epson printers.)
- *NLQ Designer ROM & FONT Disc* **£25**

ADDER



Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features:
- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

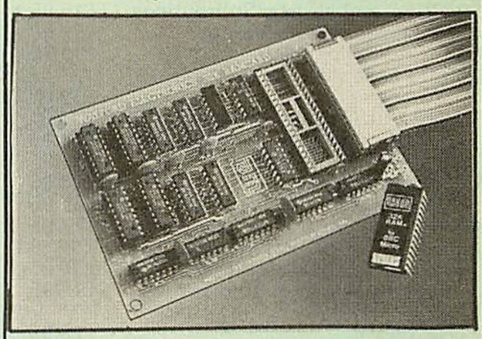
TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.
- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)
(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

Continued →

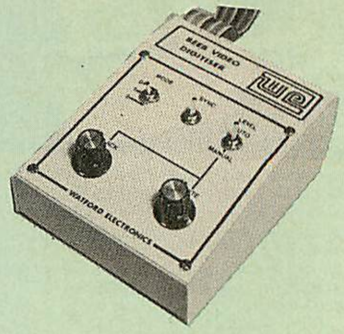
BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£4.95
15 Hr Wordprocessing BBC/WW & WW+	£4.95
30 Hour BASIC (BBC Micro)	£9.25
40 Best machine Code Routines	£7.95
50 Programs in BBC BASIC	£6.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development Package	£7.50
6502 Reference Guide	£10.95
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming	£13.00
68000 Microprocessor Handbook	£14.95
68000 Programming the	£22.95
68000 User Guide	£8.95
6809, Programming the	£16.95
6809 Machine Code Programming	£7.95
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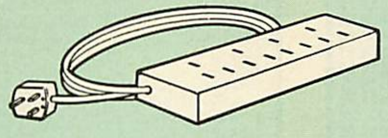
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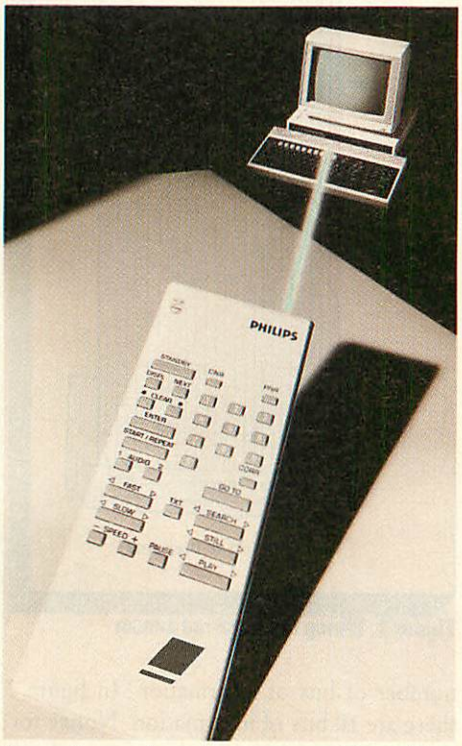
'Next; the Nine O'clock', 'Did you hear the one about the', 'Shooby do wah dee', 'Have a break', 'Iran and the', 'with a wooden leg', 'Da daddy woo,' 'Mild,' 'Gulf war', 'is seeking a...'

These are the sounds of boredom coupled with a remote controlled television. The handset is used to swap between channels, so that you 'create' a new channel made up from slices of all the others. At Telford Towers the only known cure is to remove the remote control handset. But this leaves another problem – if the TV handset isn't around, there is always the remote controlled radio! Little Miss Telford has great fun with Radio 1, 2, 3 and 4 plus Radio Cleverland.

Looking around at gadget-filled Telford Towers, I wondered how many homes have these remote handsets, and why just one handset can't do for all equipment or at least a single handset for a number of appliances. Why can't we communicate with the BBC micro using handsets?

What's in a handset?

Opening up most of the handsets commonly found in homes will show a few batteries, a couple of light emitting diodes (LEDs), a small but complex integrated circuit and a keypad. This almost always springs apart when the handset is opened. If your handset is of the older, ultrasonic, variety, then it can't really be pressed into service. This article looks only at infra-red handsets, and even then, only some of these are suitable, as I'll explain in a moment. Infra-red light is invisible – it's beyond the red end of the rainbow. The handsets use this light to transmit a signal to the appliance. Handsets for different pieces of electronic equipment must transmit different in-



formation, otherwise they would conflict, and you could switch the video with the TV's handset, or the lights with the stereo's remote control.

To find out how the transmitter works, you need to be able to sense the infra-red light signals. To get started, you have to buy a couple of items. The first is a metre of 20-way ribbon cable with a connector on each end. This plugs into the user port, and provides a straightforward, cheap input interface for our sensor. The cost of the cable will be about £5 from any computing shop or you can make up the cable yourself a bit cheaper from ribbon cable and two 20-way IDC connectors. These push on to the cable in a vice and don't need any soldering. If you've already got a cable for something else, then you can use that – you only need it to connect the infra-red sensor.

This second item is an OP500 phototransistor, available from Radio Spares as an 'Infra-red detector', part number 306-083. I picked this up from a local high street TV service shop for under £1. If fact, I tried several devices, but only this one worked satisfactorily, because it is particularly sensitive to infra-red. A word of warning, the OP500 is partly sensitive to visible light too, so don't try to make it work in bright direct sunlight.

Figure 1 shows the circuit I built to look for signals from the handset. It shows how the OP500 was connected to the IDC plug – notice that it connects between pins 19 (ground) and 20 (data line 7) of the user port. The lead which plugs into the PB7 connector is identified by a flat spot on the casting of the device. If you plug it in the wrong way round then no damage will occur; it just won't work! If you're having trouble, then take out the OP500 and reverse the connections. To check that the device is working connect it up to the user port, and simply type:

```
REPEAT P.;?&FE60 DIV 128
;:UN. FALSE
```

Strings of 1s should now appear. Now point the OP500 at some bright light, say the sun, and the 1s should change to 0s. If this doesn't work, the OP500 may be connected wrongly. If the light level in the room is too bright, then you might only get zeros. The next stage is to try a remote control handset. Just point the handset at the OP500 from a couple of inches away and hold one of the buttons down. The occasional 0 should appear in the lines of 1s – in my case this was a very occasional 0. This isn't because of lack of signal strength, but because most handsets transmit thousands of signal pulses per second.

To catch all those pulses we have to write our programs in machine code, which is considerably faster.

Machine code signal capture

Listing 1 on the yellow pages will allow you to look at the handset's pulses. Type in the program and save it to disc before you run it. Always do this with machine code programs, because you can never tell what the result of a typing error will be! The program is almost identical to the previous one-liner, but this time in assembler. It uses some comparisons to generate its 1s and 0s. A 1 is generated when the input is not positive. A byte is regarded as being positive if its value lies between zero and &7F, and negative from &80 to &FF. The last, or highest, bit of the byte (bit 7) indicates whether the byte is negative. Of course, the OP500 is connected to data line 7 of the user port at location &FE60. The JSR &FFEE is simply a pre-written piece of code in the BBC operating system. All it does is to print the contents of the accumulator as an ASCII character.

Now when we run the program and try the transmitter, the signal should look somewhat clearer, but even now it won't be possible to recognise any pattern from the handset. The original version of listing 1 used Osbyte calls to read location &FE60. This makes it work over the Tube, but it proved too slow; the direct 'LDA input' has to be used to get the necessary speed. Note that the only way out of this little program is via the Break key – aren't you pleased that you saved the program first?

Pulse trains

The signal from most handsets follows the format of figure 2. This is a graph of a typical handset's signal, in which the 'on' periods of infra-red light are represented by the 'hills' and the 'off' periods are represented by the 'valleys'. Notice that the hills and valleys are very steep, because the infra-red light is switched on and off very quickly. The description given to this type of signal is 'pulse width modulated'. In other words, the real signal is hidden in the widths of the various pulses. Notice that the 'on' pulses are almost always identical in size. They only serve to split up the off pulses – and it's the varied width of the 'off' pulses that carried the information. All the infra-red handsets which I've looked at follow this pattern of coding the signal in the off periods between the pulses of light. Look at the off periods: the first thing to notice is that there are a distinct

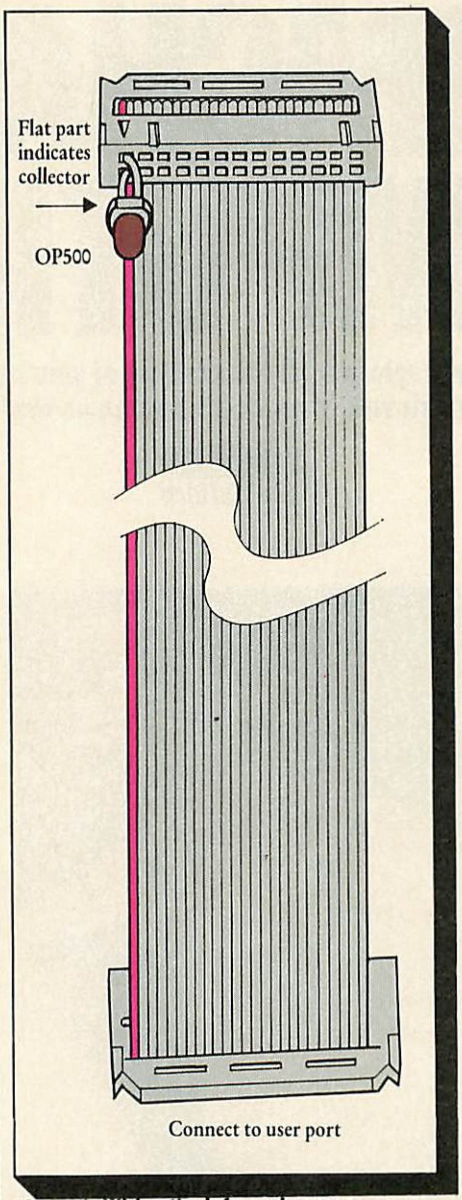


Figure 1. Wiring the infra-red sensor

number of bits of information. In figure 2 there are 10 bits of information. Notice too that the bits are split into three types; short, medium and long. In fact if you ever see a long bit of information you can ignore it, because it usually just meant that the next bit is the start of the information proper. So now we have just two types of information to look at; short bits and medium bits. If we call every short bit a 0 and every medium bit a 1 then you can think of the train of pulses as made up of 0s and 1s separated by pulses of infra-red light. We can put together 0s and 1s to make a binary number which refers to the key on the handset which generates that pattern. Each key generates a different pattern of pulses, so the 0s and 1s make up different number – the big problem is displaying these pulse trains.

Type in listing 2 on the yellow pages, and save it as 'WAVES'. This program will help you to display pulse trains like those shown in figure 2, but you must be prepared to make alterations to variables within the program to produce a regular and reliable means of decoding the signal.

Start off by running the program and wait for a beep. Now place the handset near the OP500 sensor and hold down a key on the handset. Almost immediately, a waveform will begin to appear. If the waveform is very wide, like figure 2, then it needs condensing a little. Setting S% to two should do that. Now re-run the program and press the same key every time you hear a beep. Don't try to beat the beep, or you'll only record part of a waveform. We are looking for the same waveform repeated over and over as a clean signal on screen. Don't worry if the pulses don't line up exactly, but do worry if the spaces are always different. This sometimes happens if the signal is very compressed. These problems can be remedied by altering S%, 'on' and 'off'. Make S% larger or smaller to stretch or squash the waveform so it looks like figure 3. Make 'on' as small as possible until all the 'on' pulses are reliably recorded as single narrow pulses. Setting it too small may make the 'on' pulses break down. This setting is crucial; for example my ITT IR-100 handset accepts 'on' set to one, but my Pioneer CU-1100 handset needs a minimum value of 40 for 'on'. The 'off' variable is set to spread the off pulse widths, and seems less critical: typical values vary between one and 10. If the combined value of 'on' plus 'off' exceeds about 120, then the machine code program will need a little extra space reserved for it. In this case increase the number in the DIM LCR% statement to, say, &200.

Once you can display a waveform like figure 3, you have to set the cutoff value, which causes the computer to record only one set of pulses. This is done by reducing the variable 'cutoff' until only one whole waveform is shown, like figure 2. If you feel that you are only getting part of a wave form anyway (for example if less than 10 offs are shown), then try increasing the value of 'cutoff'. It can be used over the full range zero to 256, but mostly somewhere between 64 and 128 seems about right.

Having set all these variables, run the program again and confirm that the waveform for key 1 of your handset is replicable almost every time you press the button. Certainly three out of four times is a good target to aim at. Now you can press each button in turn and see how the information changes. Alter S% if any of the waveforms go off screen. You should see that each of the keys produces a unique waveforms.

Often there are a few bits at the beginning of each signal that are identical. These act as 'recognition bits', so the receiver on your TV can tell it is being instructed to do something. The unique part of each signal lies in the last few bits of each wave – so the beginning of the signal is not really needed. Once you have the waveforms on screen, make a list of the important information contained in these pulse trains:

- How many bits of information (short and medium 'off's) are being shown?
- Is there a section of the information at either end which is not wanted? Where does the useful information in the pulse train start and end?
- Is there a section of the signal that is the same, which ever key is pressed?.

There are about 13 bits of information, but usually it's clear the first and last are start and stop bits. In fact, all the waveforms show that interesting information begins six bits into the pulse trains. Jot down the following pieces of information for your handset:

- The value of the 'off' variable
- The value of the 'on' variable
- The value of 'cutoff'
- The number of bits
- The first useful bit
- The last useful bit.

Armed with this information you are ready to build a data file for the handset in question. But first....

How do we read the signal

Look again at listing 2. All the 'cleverness' is in the machine code, which you'll meet again in all the other programs. The code contains three sections: 'up' which is an infinite loop that waits for the first infra-red pulse, 'waitlo', a loop which counts up in the X register while waiting for the next low pulse to start and 'waithi', which is a loop which counts up in the X register until either the next high pulse starts or the current low pulse reaches the cutoff point. These last two loops are themselves part of a larger loop which counts whole pulse trains. This loop begins at '.loop' and the exit occurs after 256 pulses unless the cutoff point has been reached previously. Notice that once the infra-red signal is detected, interrupts are turned off with an SEI instruction to make the timing more accurate. This will disable the system clock but it is necessary. If you want to stop the program while it is running, simply press Escape, then blip the infra-red handset.

The FNnops function is used to add different numbers of NOP instructions to the code to match the needs of the 'on' to 'off' counting ratios mentioned above. Don't forget to include DEFFNnops in any work of your own.

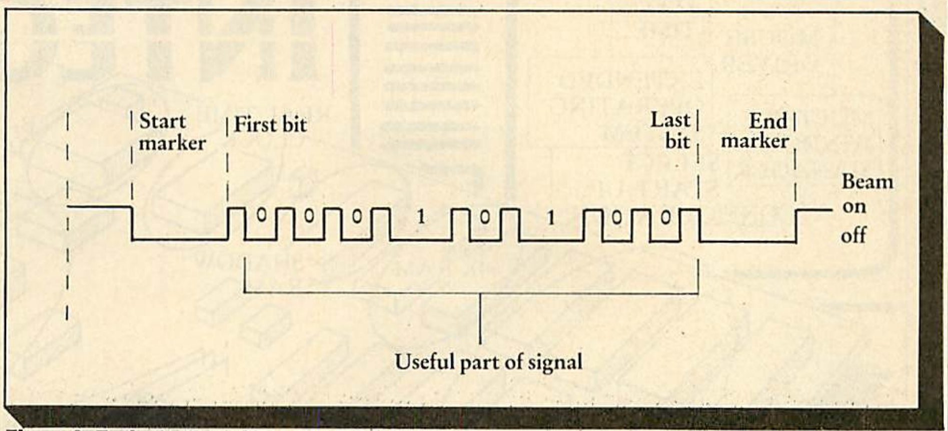


Figure 2. Typical pulse width coded signal

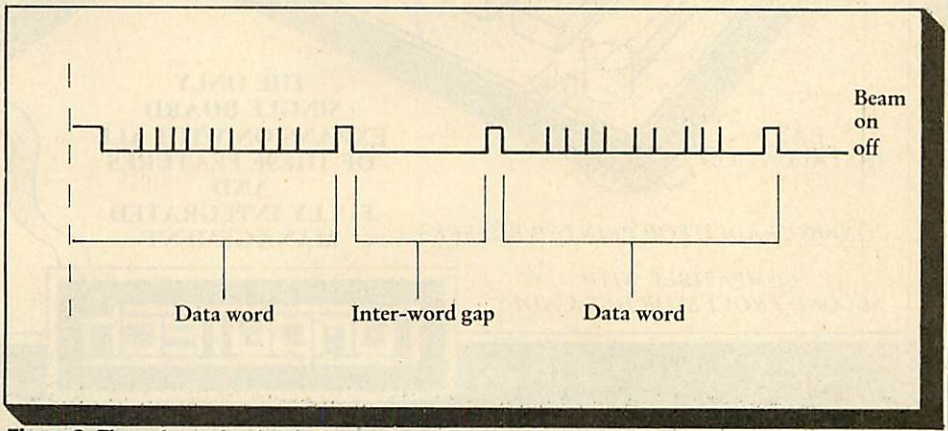


Figure 3. The pulse train of signals

```
keys: 16                          key 6 = 1002
bits: 13                          key 7 = 986
first valid bit: 2                key 8 = 1018
last valid bit: 12                key 9 = 989
mark delay in NOPs: 1             key 10 = 965
space delay in NOPs: 1            key 11 = 973
cutoff number = 128               key 12 = 1008
key 1 = 962                       key 13 = 1021
key 2 = 994                       key 14 = 997
key 3 = 978                       key 15 = 1005
key 4 = 1010                      key 16 = 992
key 5 = 970
```

Figure 4. Handset data for an ITT IR-100

Finally, in the WAVES program, the waveforms are generated by loading the pulse widths from the two buffers (onbuf% and offbuf%), scaling them according to S% then drawing them on the screen with standard DRAW commands.

Listing 3 has sufficient instructions to be self-explanatory. Load it and list its early part – with the information sheet you compiled using listing 2, alter the program lines containing the variables 'bits', 'first', 'last', 'cutoff', 'on', and 'off'. The listing is already set for my ITT handset. Now run the program and follow the instructions. This time press the handset buttons to the commands given; a beep indicates that the current button has been read properly. If no beeps are heard, and the program doesn't move on past key 1, try pressing and releasing the handset button a few times.

Once every key has been pressed, the program asks for a datafile name. Use the model number of your handset: the program adds a 'D' to the end to indicate a datafile. The data for that handset is then saved, so that any other program you write for that handset can call up the data and communicate without having to be re-taught all the information. Figure 4 shows typical handset datafile; these printouts are produced by listing 4, which simply reads the data file and

prints the contents. It's usually worth examining these data files because they confirm (or otherwise) that the handset is being decoded properly. The first few pieces of information in the handset file should match what you entered into the program before *you* ran it. The keys should all have different numbers. Two or more keys with the same number means that we must run the WAVES program again and check the pulse trains those keys produce. It might even be necessary to alter the variables again. The idea is to set up the program so that each key produces a unique code. If your handset doesn't have numbers, then you might want to stick paper labels carrying numbers to match the listing 4 printout. The program numbers the keys according to the order you press them in.

Noughts and crosses

The children's game in listing 5 is an noughts and crosses program, which plays using the handset of your choice. Load and run the program. Type in the name of the handset datafile, then press Return. The machine code in the program will be modified to match the handset. Next enter the names of the players, and press Return. The noughts and crosses screen will appear and player 1 will be asked to place an X. Press the button on the handset which matches the number square you wish to use and an X will appear. Pass the handset to the other player and the game continues until someone wins or there is a draw. Follow the instructions to press 1 for a rematch. Remember that '1' means 1 on your handset!

Users who are particularly interested in the decoding of the infra-red signal after the machine code has captured it should examine DEFFNrespond and DEFFNrx. FNrx generates a decimal number from the low pulse-widths in the 'offbuf%' buffer, and FNrespond compares this number with those in the data file.

When it finds a match, it returns the number of the key pressed. Remember – even if you press a key with the number 1 on it, FNrespond will only return a 1 if you pressed that key first in the learning program when you ran listing 3.

Upping the sensitivity

This section is really for hardware enthusiasts who want to use their own application from the comfort of an armchair. To do this properly you have to improve the sensitivity of the receiver – that means ditching the OP500, and building a more

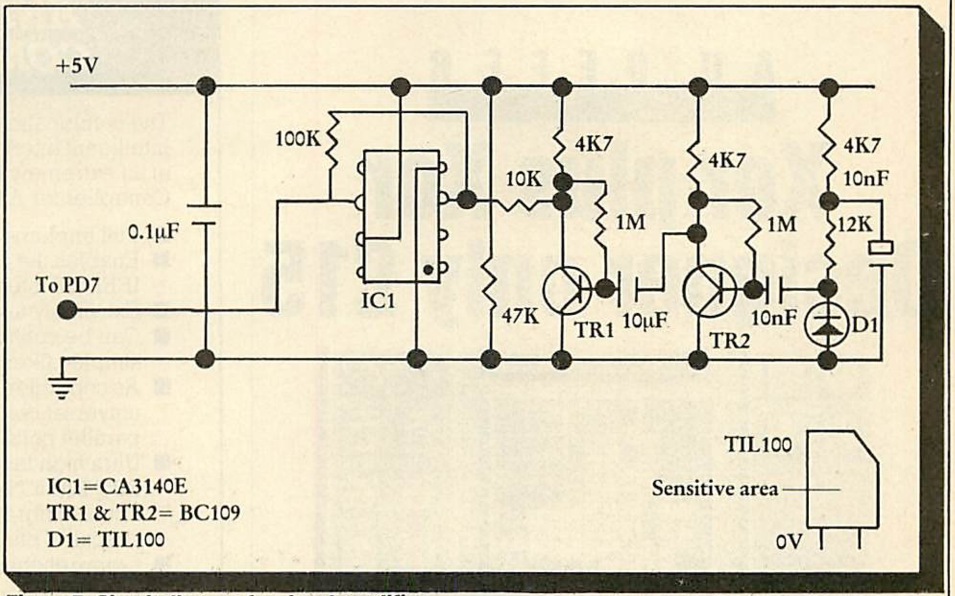


Figure 5. Circuit diagram for signal amplifier

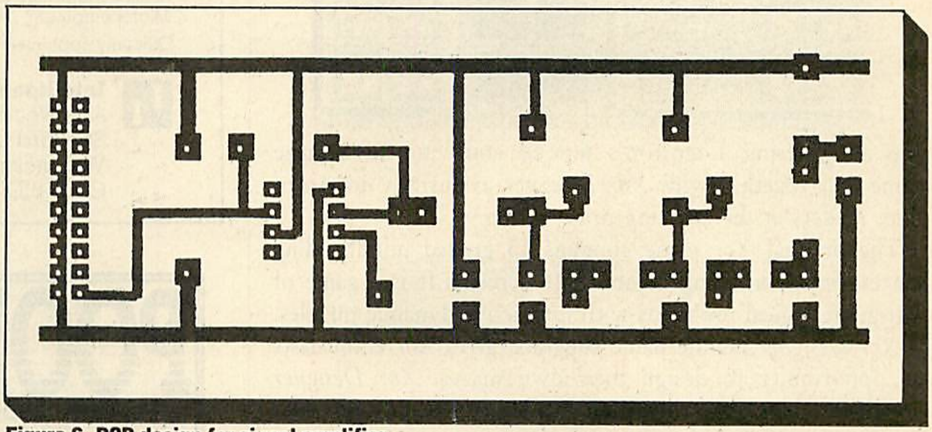


Figure 6. PCB design for signal amplifier

powerful circuit. Figure 5 shows a simple approach which uses a circuit with a TIL100 infra-red photodiode as the sensor, feeding an AC transistor amplifier. This in turn feeds another amplifier, and then an operational amplifier. Note that the linking capacitors are 10 nanoFarads each. Note too that the CA3140E op amp is a delicate piece of equipment and sensitive to static so be very careful with it when you solder the circuit together.

The circuit uses so little power that it can be powered from the user port, and figure 6 is the component side view of a full size PCB layout, drawn with last month's PCB design program. Components can be fitted by referring to figure 6 because the PCB layout mirrors the circuit diagram almost exactly. A 20-way vertical IDC connector can be added to provide a direct link to the user port. Make sure that you don't connect your 20-way ribbon cable to this incorrectly; solder the IDC connector with the cutout towards the circuitry, not, as I did with the prototype, in reverse!

In conclusion

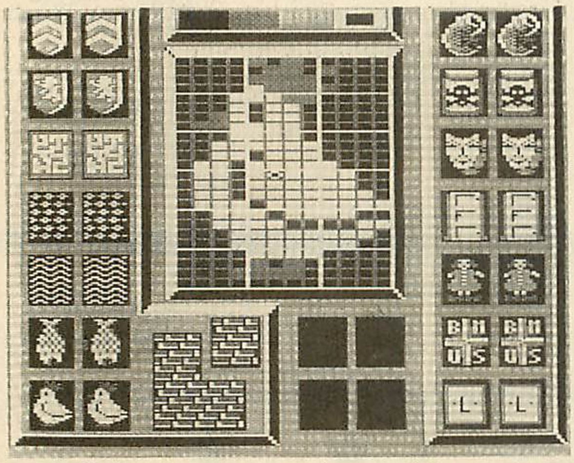
Once you've managed to get the noughts and crosses game working from your armchair, then you might want to use some of the ideas in your own programs. Clearly the machine code sections to read the infra-red signals should be used, but what you do with the keypresses is up to you. What about a running a number of different devices via the single handset? Or perhaps you could write Prestel terminal software to use the handset. Once past this stage, you may feel that the programs don't need the 'onbuf%' buffer, because the 'on' pulses don't contain useful information. You can alter the programs if you wish, but I think that they may as well stay. Who knows, that new handset you've bought might just need to use them!

If you get hooked on infra-red, let me hear about your applications and handset datasets. If we get enough, we could publish a chart of the most common datasets. You could make many of your programs remote controlled.

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STEP BY STEP AIR FLAIR

Practical advice on how to make the most out of your art package and produce complex designs from the simplest of shapes

Phil Wilkes

A recent letter to *Acorn User* pointed out that while programs such as art packages are often reviewed, there is little guidance on how to use them. So for David Wild (September Letters), and anyone else trying to produce good graphics, here are some ideas I've found useful.

The approach I will take is to talk through the production of the picture shown in figure 1. This was drawn with a mouse and *AMX Super Art*, but don't be put off if you use a different system; the techniques will be very similar.

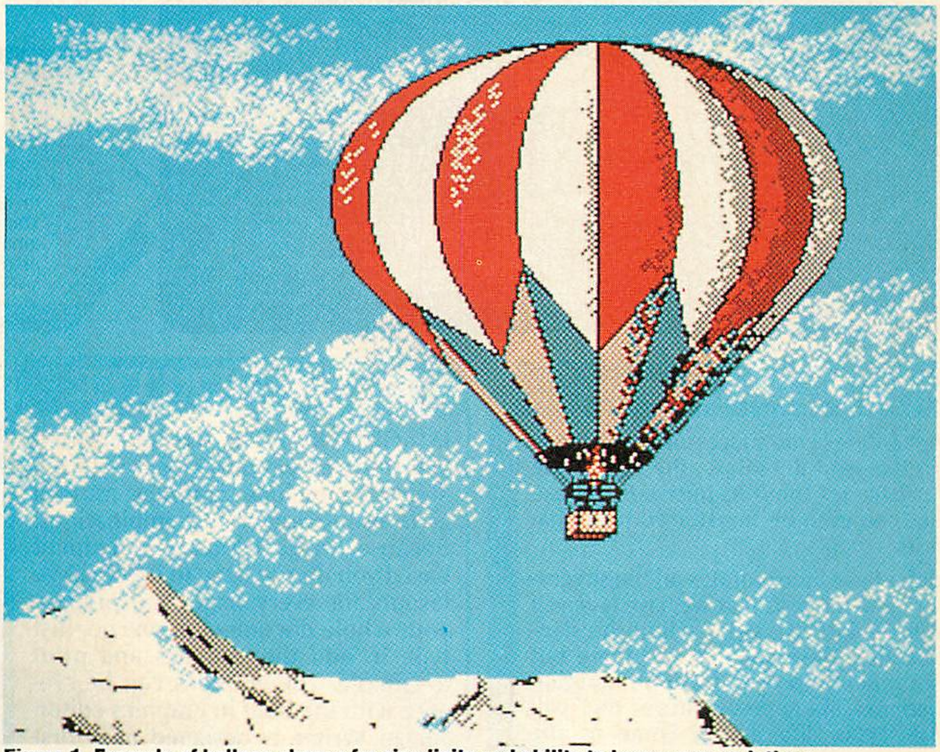


Figure 1. Example of balloon chosen for simplicity and ability to have many variations

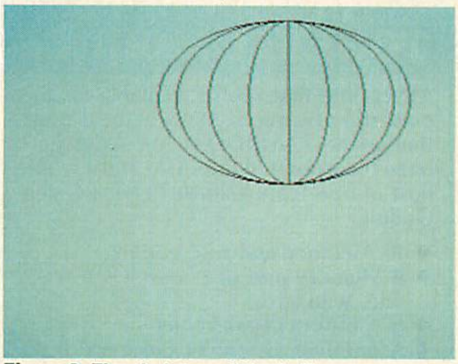


Figure 2. The skeleton of the balloon is made up of four ellipse shapes

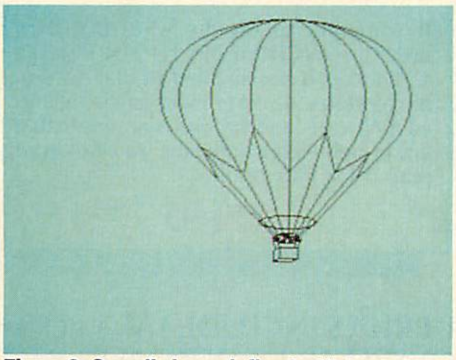


Figure 3. Overall shape defined with basket, but fine detail is left until colour is added

The best way to learn anything is to try it yourself. Drawing one picture will teach you more than reading about 10, so I hope you will be able to use this article as the basis for your own pictures. This need not be a strict copy, but I hope some of the techniques used to draw the balloon will help you experiment.

The first stage of any picture is simple, but very important – what is the subject going to be? This may seem obvious, but some subjects do not translate well to computer graphics. It is no good trying to achieve subtle shading when there are only four colours available! You will also need to decide on the composition; in other words, how the different elements of the picture are to be arranged. Try doing a few rough sketches on paper to get a good effect. Artists always aim to get a good balance, and yet retain the division between foreground subject and background.

Your choice of subject is more or less unlimited, but for my example I wanted something that was easy to draw, based on simple geometric shapes, and that could be modified to produce several variations. As Jonathan Inglis explained in *Acorn User* December 1987, you have to pick subjects that sort the style of the computer.

I eventually settled on a hot air balloon. This is a simple shape which can have a variety of designs on it. It is also a colourful and popular subject. I have shown it low over a snow-covered mountain top, this being both dramatic and easy to draw! You may wish to follow the main ideas but show a different background. Perhaps you could try open fields or possibly a rocky shoreline; both are quite easy to draw and

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would give the picture a very different overall look.

Having chosen a subject, I usually decide which graphics mode to use, although you may be limited by your software. Normally I use mode 1, which offers the best compromise between resolution and colour. As only four colours are available in mode 1, you must also decide which of the eight possible non-flashing colours to use. This choice will be governed by the main colours in your subject. Remember that intermediate shades can also be achieved by using patterns of two or more colours together. Thus a red and black pattern can approximate to brown. Most software, including *Super Art* and many drawing packages, offers 'dithered' patterns in their palette options.

For the example picture, I chose black and white, cyan for the sky and red for the stripes on the balloon. As the red only appears on the balloon, you might like to try a different colour. You can always change it later!

Getting started

The first stage of the drawing uses some ellipses to give a basic shape for the balloon. For any drawing, try to find a few simple shapes which will indicate the main elements in the picture. This will help you to check the composition and to establish the skeletons of main subjects. Using simple geometrical shapes saves time as they can be drawn from the on-screen menu without having to resort to your freehand skills. Don't try to put in detail too early – there's nothing worse than doing a superbly detailed part of a picture, only to find it is too small for the rest of the scene!

Set up a screen with a white background. With *Super Art* use the Create option to make a full-screen size picture. One drawback with *Super Art* is that you can't see all of a full-screen picture at one time while you are drawing it. In my picture the balloon is towards the top-right of the screen, so the picture window has to be moved to that corner.

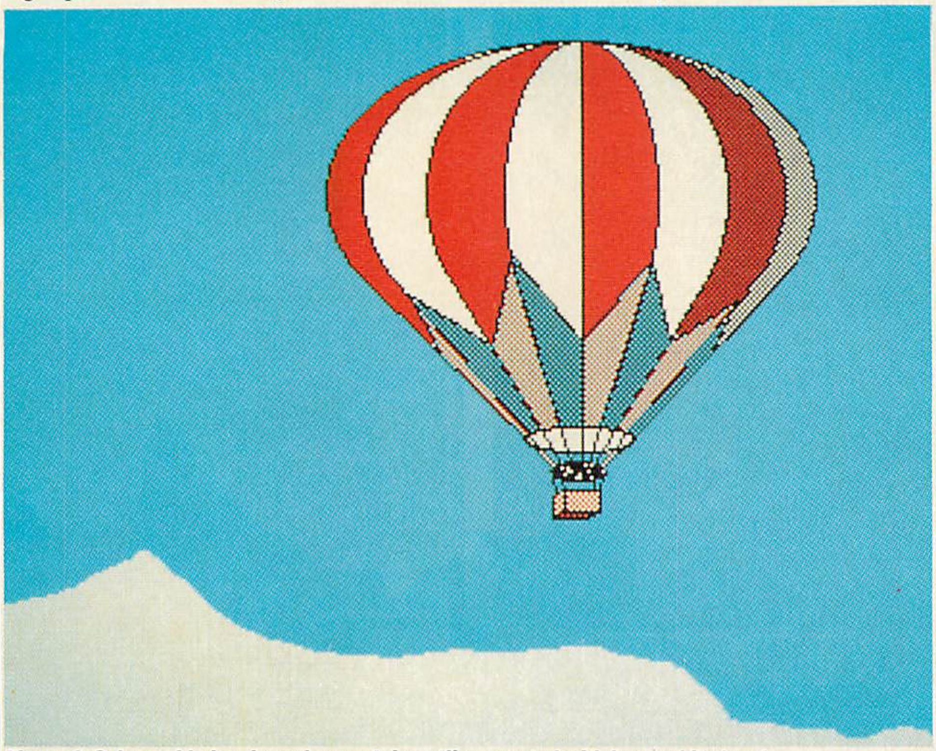


Figure 4. Colour added and rough mountain outline created with large white brush

The shape of the top of a hot air balloon is not circular but flattened, so start with an ellipse which is about twice as wide as it is tall. Don't make it too small or the balloon will look lost in the final picture. Next, put in progressively narrower ellipses which will form the stripes on the balloon. Be careful to align the top and bottom of these accurately. Remember that the balloon is a three-dimensional object, and that the stripes towards the edge of the balloon will appear narrower than those in the middle. Finish with a line down the middle. You should now have a picture which looks like figure 2.

Having taken such care with drawing the ellipses, the next step is to delete them! Well, not all of them of course, just the bottom edge. Use a white, filled rectangle as a 'rubber' to do this, as it's quite a large area. Then, back in black, extend the centre line down a fair way. Extend each of the loose ends of the elipses on the top part of the balloon down to cross at a single point, giving you the basic shape of the bottom of the balloon.

We will be looking slightly up at the balloon, so the bottom edge of the balloon fabric will appear as a very thin horizontal ellipse. Draw this in so that it just touches the outer lines. Just beneath this, draw a second smaller ellipse which will form the burner assembly.

Now select the eraser option, or a white brush shape, and delete the lines beneath the burner ring, as these were for guidance only. Select an outline rectangle and draw in the front face of the basket just under the burner ring. The overall shape of the balloon is now defined. It's a good idea at this stage to save your work so far. It's best to save a picture after each stage of drawing, so that you can go back to the original if you make a mistake on the next stage. You could call the files, say, 'BALL1', 'BALL2', and so on.

Before starting to add colour, add a little detail. Don't get carried away – your aim should be to get all the outlines correct and divide the main areas to be coloured. Very fine detail is best left until last. Your picture should now resemble figure 3, although you may have chosen a different pattern on the balloon itself.

While it is still a line drawing, take a long hard look to check the overall shape, size and proportions. It will be much easier to change these now than at a later stage. Don't be afraid of deleting sections of your drawing, and doing them again until you are satisfied. That's one of the joys of computer art – it won't show on the finished picture that you have re-drawn it 20 times!



Figure 5. More shading emphasises shadows and highlights. Detail added using pixel editor

Adding colour

The next stage uses the fill function to add the main areas of colour to your picture. All good drawing software has a flood-fill option to create large areas of colour. The

main colours are cyan for the sky, red for alternate stripes on the balloon and some simple two-colour patterns for the lower balloon areas and the basket.

Notice in figure 4 that the two furthest right stripes are filled in red/black and white/black patterns. Now you are adding colour and shading, it is important to establish where the light is coming from. In my picture, it is coming from fairly low on the left. Therefore, the right-hand side of the balloon will be in shadow, and hence the darker colours.

Also in figure 4 I have started to add the mountain top. I just put this in roughly with a white, large brush shape to indicate its position and general outline. Notice that the peak is on the left, balancing the balloon on the right. Remember what was said about composition earlier on?

Now it's time for more shading to emphasise the light. Shadows are brushed in on the mountain in a white/black pattern, giving it more form. A light spray or airbrush effect is used on the balloon to add further shadows and highlights. Detail is added to the burner and basket using a zoom (pixel editing) facility. The balloon, although not the entire picture, is now complete (figure 5).

Now all you need to do is to add the final touches. Detail is drawn in on the snow to give a rougher, more broken appearance. Finally a white spray is used to put in some layers of cloud, for a bleaker, more wind-swept feel. These can be drawn very freely, although be careful of overlapping the balloon. If you do get a few dots in the wrong place, a small brush or the zoom facility should soon correct it. If you feel the clouds are too dense, simply select cyan and thin them out with the spray option.

And there you have it! If you have followed the pictures and text, you should have something similar to the original in figure 1. But feel free to experiment. In fact, that is the whole point of this article, to encourage you to experiment. You won't learn if you don't have a go, and the more you do, the more confident you will feel. Don't be disheartened if things don't quite turn out the way you planned – you will have learnt something useful for next time.

To give you some more ideas, figures 6 to 8 show a set of pictures with notes on how they were done. The first is a digitised picture taken from an advertisement. The digitiser was effectively used as a 'still camera' to get the picture from the printed page onto the computer. Once saved us a screen image by the digitiser software, it could be loaded into *Super Art* and edited just like any other picture. In this case, the major charges involved cleaning up all the random dots left by the digitiser and adding the 'Audi' text. Figure 7 is similar – a modified digitised image. But the digitiser software produces a mode 2 image, so the screen image was converted to mode 1 before loading it into *Super Art* for editing. The Joan Collins portrait in figure 8 looks digitised, but in fact was created using just ordinary graphics software.

If you really want to take computer art seriously, there are a few specialist books available and *Acorn User* produces three *Gallery* discs of pictures. Alternatively, there are countless books dealing with more conventional drawing and painting, from which a lot can be learnt and applied to computer art. You never know, you may become hooked – I know I am!

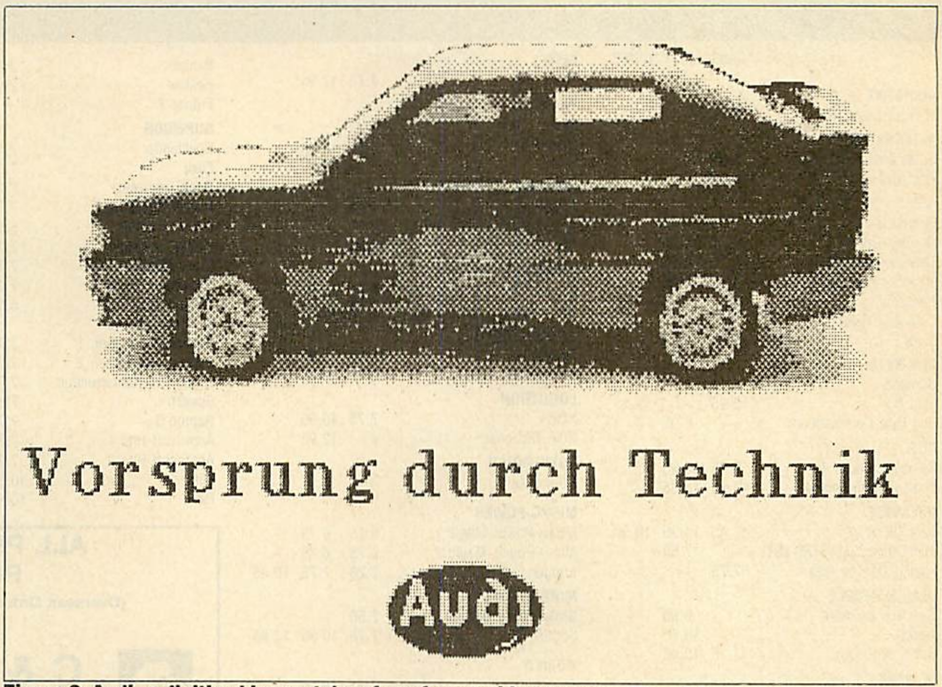


Figure 6: Audi, a digitised image taken from from a video camera. The picture was loaded into *Super Art*, and tidied up. The text was added last



Figure 7: Woman's face – this was a mode 2 digitised image, converted to mode 1

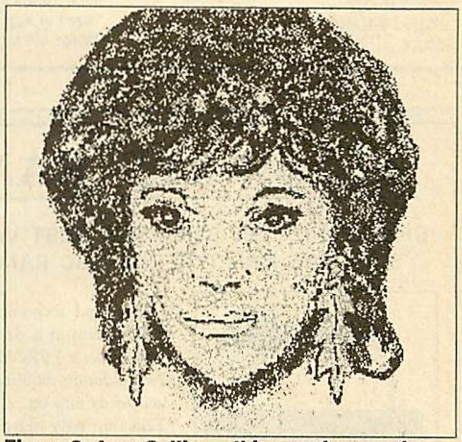


Figure 8: Joan Collins – this was drawn using brush and spray effects only

FURTHER READING

■ Super Painter: Jonathan Baldwin's all-round drawing package was published in *Acorn User* January 1986

■ Art to Art Conversion: How to convert pictures from one mode to another, it can help transfer pictures from one art package to another. October 1986.

■ Kiddie Art: A children's drawing program from January 1987. Simple drawing facilities based on squares and triangles

■ Get the Picture: How to use video digitisers, published in the September 1987 issue. Digitised pictures can form the basis of a picture, by cleaning up the image with an art package

■ Special graphics issue: *Acorn User* December 1987 contains lots of advice from Jonathan Inglis and Paul Bayley for budding computer artists

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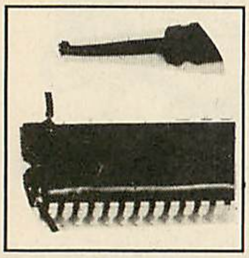
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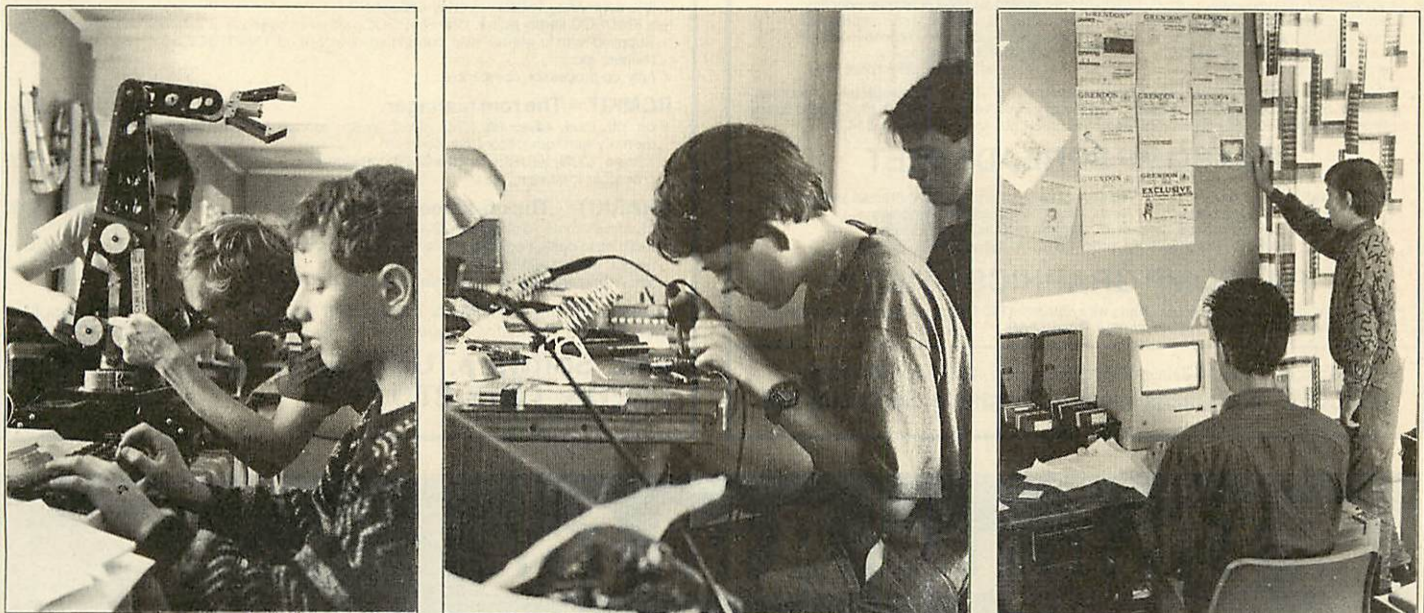
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COMPETITION

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A chance for our younger readers to win a micro enthusiast's dream holiday – a week at the Computer Park

Graham Bell



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There are two holidays up for grabs: the first is a week running from August 6 1988, the second from August 13. You've got a chance of winning if you answer the three questions below.

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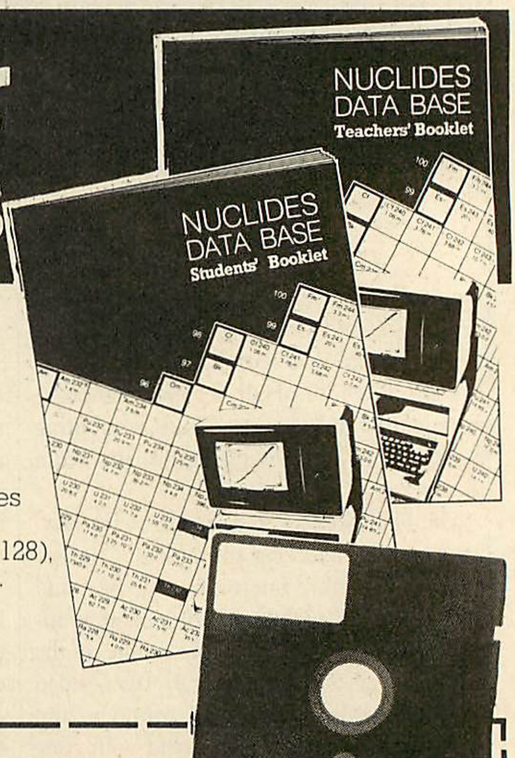
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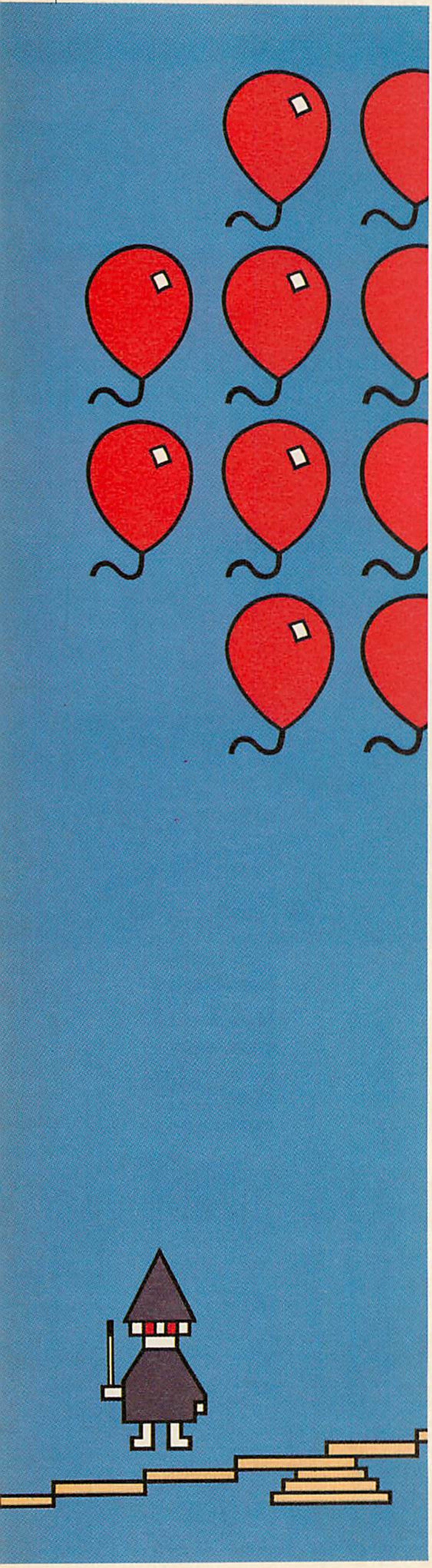
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FLYING WIZARDS

An infuriating machine code game to keep you amused over Christmas

David Lawton

Games writers face one difficult problem right at the start: thinking up an original idea. Most games fall into one of the following categories: shoot the aliens, arcade adventures, straight adventures, cute (*Pacman*), simulations or strategy. Finding games that don't is tricky.

When I first though of writing a game, I immediately discarded ideas featuring large graphics, large maps or extensive puzzles. Space in a magazine is limited! Games like *Elite* or *Revs* were impractical, and simulations are too specialised for general interest. I did think a board game might be good, but for many games, making the machine play well is awkward. In the end, I was left with a simple framework; a number of graded screens with the same theme in each, a simple plot with simple controls and a silly tune!

Wizalon is actually loosely based on an arcade game from years ago – in the days of cellophane on the screen to create the colour. I can't remember the name of it, but I would be interested to hear from anyone who does.

Technically-minded people may also be interested in the variable and subroutine details. If you haven't yet typed in the program, read the 'how to enter' sections carefully, then turn to the yellow pages. There is a lot of machine code and a lot of data, so the monthly disc is a good buy.

The game

Once upon a time, there were two good wizards, Nino Qunty and Brahel Gelm. They lived in the White Castle of Nur Eracos and did good deeds for the local residents: they controlled the weather, cured people and filled in tax returns. One day the evil sorcerer Jefel Droot tricked Nino and Brahel into entering his lair, the



Can you make the highscore table?

Black Citadel. Here he trapped them in one of his evil dungeons, which he then filled with deadly red balloons. The only escape route for Nino and Brahel lies in bursting these balloons. Luckily, all is not lost; Brahel has managed to summon his magical seesaw, and it is now up to you to save the good wizards from the evil clutches of Jefel!

In practise, you have control over the seesaw at the bottom of the screen. 'Z' moves it left, 'X' moves it right. You can also flip it round by pressing Return, and 'P' is pause/unpause. At the start of the game, one wizard will appear on the seesaw, the other in the air. The idea of the game is to keep the wizards bouncing in air, bursting the balloons. To start with, just try moving the seesaw so that the airborne wizard lands on the 'up' end of it – the other wizard will then take off. After a few goes you may notice than landing on different parts of the seesaw causes the wizard's flight to change. Some changes are quite subtle; others quite dramatic – the seesaw is magic!

The wizards will bounce off the balloons, but if they manage to spike the underside of a balloon with their pointed hats it will burst. Balloons will also burst if the wizards land on top of them six times, but this scores fewer points. If a wizard fails to land on the 'up' side of the seesaw and he'll also lose some of his bounce. The trident on the right of the screen will descend slightly as a

penalty – when it hits the slowly rising balloon, the game ends.

When all the balloons on a screen have been burst, the wizards disappear, you gain a bonus for the amount of time left and the trident may be raised too. The next screen is then drawn, the wizards reappear and the game continues. As mentioned before, the game ends when the balloon on the right bursts. If your score is among the top eight you are then eligible for the highscore table.

The balloons on the left form a 'balloon tube'; this is where the balloons for the main screen come from. The top line shows your current score, the current level and the current highscore.

To gain height, try to make the wizard land nearer the pivot than the wizard on the seesaw. Landing further away will loose you height. If the wizard takes off from either the end of the seesaw or right next to pivot, he'll bounce sideways too. It is sometimes worth sacrificing a drop in the trident to go sideways.

Technical details

The game is all in machine code, and is divided into sections. The last section is the data and is contained in listing 2. Among the data can be found the messages, the highscore table, the screen designs, the balloon and wizard sprites, the music, the score digit typeface, the seesaw graphics and conversion tables.

The other five sections are detailed below, and where a particular section of code is referred to, it is named with a label.

Initialisation

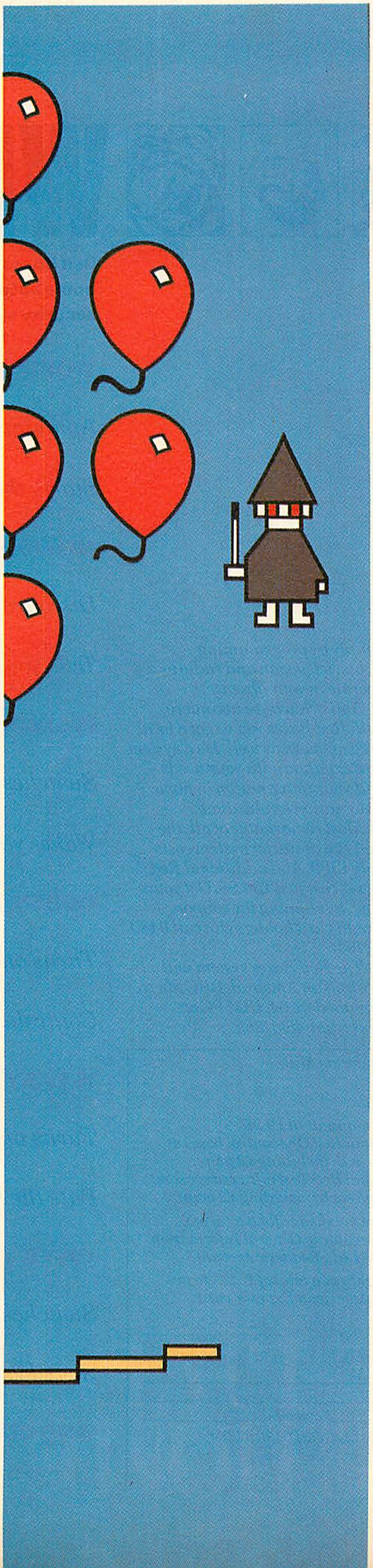
This can be sub-divided into three processes. First, the initial setup (.start); the sound envelopes are set and Escape is disabled. Next .gameloop; it sets up the variables that need to be set every game. The screen layout is also set here. Finally .screenloop; the actual screens are drawn, and the bonus is added. Further code (.donebonus) makes the balloons move up the balloon tube and appear on the screen.

Main game code

This starts at .main. First the number of balloons left is checked; if that's zero, the level is finished. The time left is decremented, then the balloons are moved (between .balloop and .nocollide).Collision detection is done be checking each balloon with the co-ordinates of wizard two; wiz2x and wiz2y.

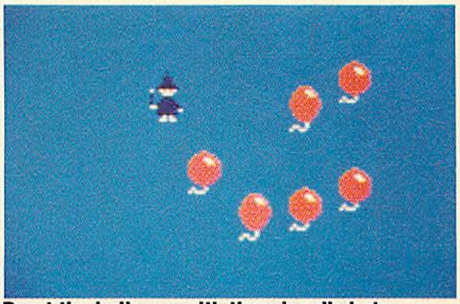
After (.balldone), the current wizard positions are saved and the new ones

ILLUSTRATIONS BY ROBIN MACFARLAN



calculated. It is worth noting that wizard two is always in the air and wizard one is always on the seesaw – this greatly reduces the code needed for collisions and movement. Wizard one's co-ordinates are also offsets from the seesaw, not absolute co-ordinates. Wizard two's jump trajectory is calculated and a check is made if he has hit the ground; if he has then .hitground is called. At .inair, the keys are looked at. 'Z' and 'X' control the seesaw position, 'Return' calls .shift to flip the seesaw, and 'P' simply starts a loop which ends only when 'P' is pressed again.

The wizards are deleted and re-drawn after the *FX 19 in .notp – this reduces screen flicker a lot.



Burst the balloons with the wizard's hat

Main subroutines

The main subroutines start at .dotube. This shows the current state of the balloon tube. .doballx moves and displays the balloon number X. This only does one in eight balloons, to speed things up. It also means that the balloons don't all move together. .showtime shows the timer balloon and the trident on the right.

.hitground is called when wizard two hits the ground; .splat is called if he didn't land on the 'up' side of the seesaw, and it reduces the wizard velocity and lowers the trident. Otherwise .hitleft or .hitright are called depending which side was hit. Both routines calculate the distance from the centre of the seesaw for each wizard and use this to alter the vertical velocity; .dobounce is then called to check this new velocity, flip over the seesaw, and swap the co-ordinates of wizard one and wizard two. .shift flips the seesaw and calculates wizard one's vertical co-ordinate. The .ssput routine calculates the address of the seesaw and pokes either a left or right-facing one depending on the value of the variable 'seeside'.

The .flashwiz routine makes the two wizards appear and disappear. The actual work is done by swapping between two sprites with .starflash. .add adds the accumulator to your score and then calls .pokenum to display it in fancy characters. Your

score is compared to the highscore and if greater, .pokenum is used to display it.

.pokenum is used to a poke a decimal number onto the screeen at 'at'. The obligatory trailing '0' is also added, to make the score seem more impressive.

The highscore table

The score table is entered at the end of the game, or when Escape is pressed. First of all, the wizards disappear; any remaining balloons burst and 'Game Over' is displayed. This is done between .highscore and .findhpos. After this, the highscore table is searched from the top downwards until your score is greater than a highscore. If this doesn't happen, the program jumps to .nohscore. Otherwise .entername is used to enter a new name. The main section of this (.input) bounces the wizard cursor and waits for any ASCII key, Delete or Return. Characters are added if there is space; .delete is called if Delete is pressed, to delete the last character. Finally, .return pads out the name with spaces ready for the table. .shufscore and .shufnames are used to shuffle the names and scores down the table and .stname stores your score and name in the table and the routine .nohscore displays the highscore table.

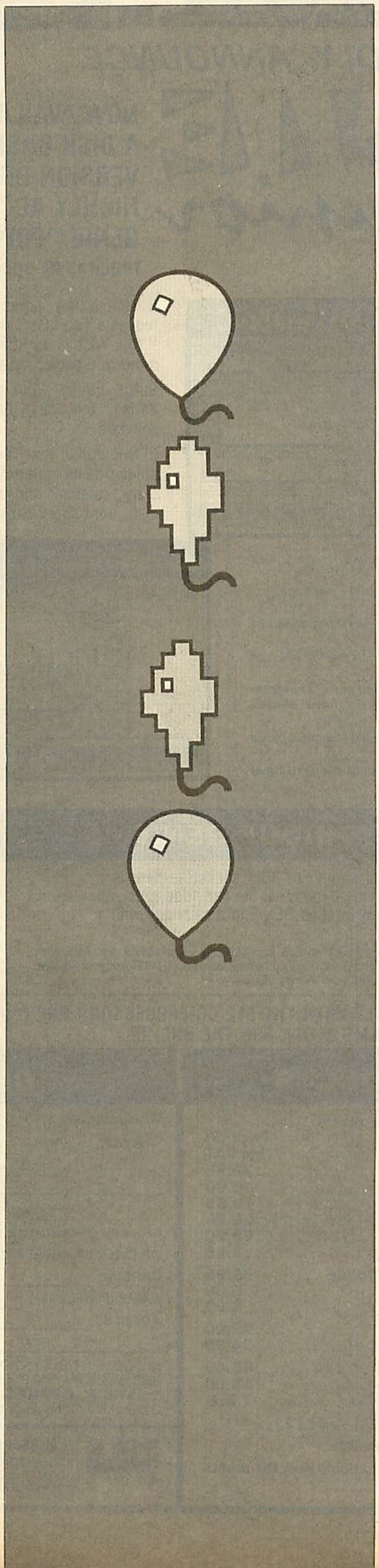
The Wizalon characters

Because so many things are moving at once on the *Wizalon* screen, a quick means of drawing characters on the screen was needed. Two routines are responsible – .showwiz which displays a wizard, and .showsprite which is a routine to display all other characters.

Each character or sprite has a number. To eliminate the need for a separate routine for blanking out characters, sprite number seven is left blank and is simply placed on top of a character to wipe it out.

The main difference between .showwiz and .showsprite is that .showwiz uses a technique called masking. This has two important effects. First, less damage is done to the background by a passing wizard. Without masking, a flying wizard would leave a trail of blue squares behind him! Second, when the wizards meet, the effect is neater. Again, blue squares would be rife, but by using a mask, you can even see one wizard through the gap between the other and his wand.

Both .showwiz and .showsprite call two subroutines, .showsub1 and .showsub2. .showsub1 works out where the data describing a particular sprite begins, and where on the screen (exactly which byte in memory), the sprite should be drawn. The routine .showsub2 builds on the hard work of .showsub1, preparing screen addresses and counters for. showsprite and .showwiz.



Because of the awkward way the screen is laid out in memory, some extra code is required to ensure data is put exactly where intended. The screen is made up of character rows, each eight bytes high, so the sprite data needs to be spread over these rows with care. The variables count1 and count2, set up by .showsub1, are used by .showsprite and .showwiz to determine which chunks of the sprite are put on one character line and which on the next.

The game uses mode 1, so each byte of screen memory represents four horizontal pixels. So that sprite movement is smooth, each character has four images – one for each pixel position. Because each image takes up 64 bytes of memory, each character requires 256 bytes. For speed and simplicity, the main playing area is square. This enables the horizontal position of a sprite to be squeezed into a single byte. So, to show the trident, time balloon and balloon tube, which are outside the area, an extra offset has to be used. The variable 'offset' is given a value depending on the area of the screen onto which the sprite is be put.

The tune

The tune was originally created using the *Theme* music editor featured in *Acorn User*'s April 1987 issue. Just two voices are use, a simple bass line and a melody. But the original melody was a bit repetitive, so to improve matters an element of randomness had to be introduced.

The *Theme* tune was converted into an *Autumn* file – the standard tune format also described in April's issue. This file was in turn broken down into individual bars, each of which was given a 'type' number. This value reflected the harmonies suitable for that particular section of tune.

Bars of similar types were collected together and counted. The tune data produced by this process are stored at tune% in the main listing. Each segment of the melody is stored as a series of pairs of numbers – a pitch value followed by a duration value. A segment is terminated by the value 255. The routine .play calls .voice which plays the next note of the melody. The subroutine .adval is called to check if the sound channel is ready to accept another note. If it is, the note is sounded. This prevents the game waiting for the sound buffer to empty. If the voice has come to the end of a section, .nextbar is called. This

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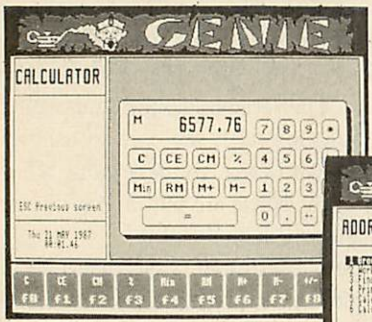
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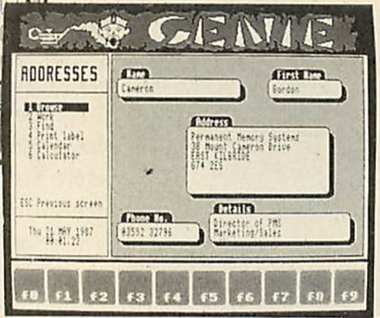
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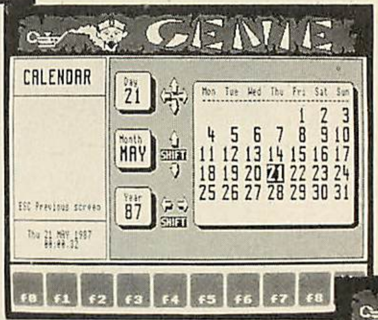
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"A&B Computing" June 87. . . *extreme friendliness of design. . . eminently practical piece of software. . .*

"Your Computer" July 87. . . *a product which can stand alongside its 16 bit role model. . . one piece of software I have always wanted. . .*

"BEEBUG" Aug 87. . . *extremely versatile. . . a most useful piece of firmware. . .*

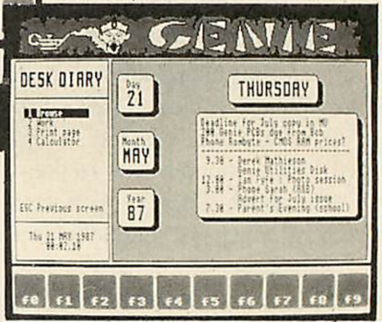
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routine looks up the 'type' of the next bar and with this in mind, selects a random tune segment by calling .randplay.

To make life a little easier, the bass line consists entirely of notes with a duration of a fifth of a second. Each bar is made up of eight bass notes. For each bass note, a pitch offset is stored, and this is added to a value from bassp%, which is related to the type of the current melody segment. The result is the bass pitch to be played next.

For added variety, the bass line follows four 12-bar patterns played in sequence. For even more variety, two sound envelopes are used in the tune. A new envelope may be selected every 12 bars.

How to enter the listing

The game comes in two parts. Listing 1 on the yellow pages is the machine code and listing 2 is all the data. Both are very long, and need careful typing. First, type in listing 1 and save it as 'MCODE' but do *not* run it yet. Then type in listing 2 and save this is 'DATA'. Again do not run it. Now, if you have made no typing errors, the following will assemble the game:

```
PAGE = &2000
CHAIN "Mcode"
```

This first assembles the code then performs a number of checksums. If you have made any mistakes, you'll be informed of the area in which the error lies. Don't forget that your mistake won't necessarily be in this section – it could be wrongly defined variable or subroutine – so check all the definitions used in the section too.

When all is well, the program will print 'Saving...' and will save a file called 'GAME'. Now to compile the data type:

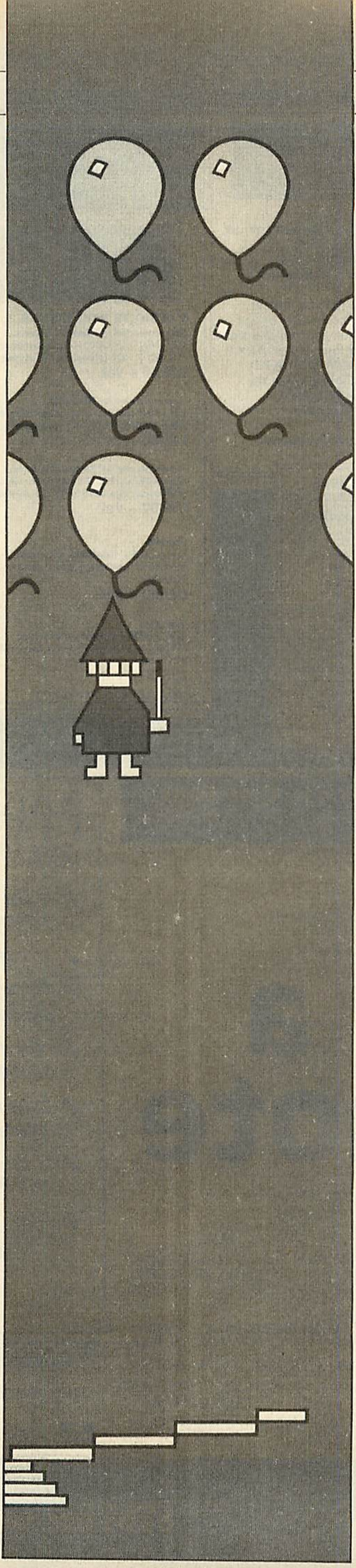
```
PAGE = &3000
CHAIN "Data"
```

This checks each of 11 data blocks. Again you will be informed of any errors. When no more errors occur, the 'GAME' file will be loaded and 'WIZALON' will be saved. You can now at last play the game by typing the following:

```
*RUN WIZALON
```

Converting for the Electron

The *Wizalon* game will also run on the Electron, although it is slower and has no sound, if the following changes are made. Delete lines 3790, 3800, 12600, 12610, 14630, and 14640. Add '9201 RTS', and change the checksums in lines 15370 to 15440 to: 23876, 31536, 31428, 29820, 39990, 38043, 41542 and 37068.



VARIABLES AND DATA TABLES

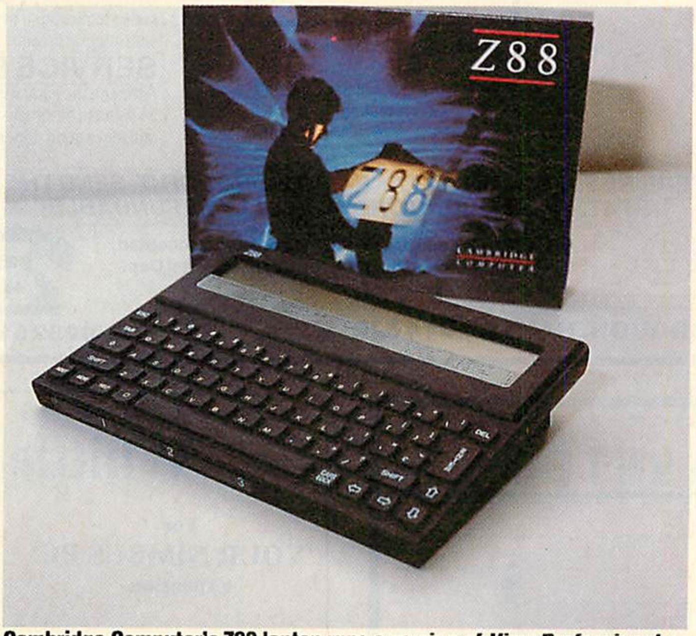
Name	Address	Description
useful	0	General work space
maskadr	2	Location of wizard mask
time	4	Position of time balloon
trid	6	Position of trident
at	A	Where .pokenum puts score
score	C	Current score
count3	11	General purpose counter
count4	12	General purpose counter
x	13	Temporary location of X
y	14	Temporary location of Y
ytmp	15	Temporary location of Y
ypos	16	General purpose Y position
num	17	Where .decimal expands numbers
dflate	18	Counter for deflating balloons
name	20	Entered highscore name
read	70	Sprite read location
write	72	Sprite write location
bonus	7C	Amount of bonus score
tube	7D	Height of balloons in tube
sspos	7E	Horizontal position of seesaw
temp	7F	Temporary location
seeside	80	Direction seesaw points
wiz1x	81	Wizard 1 X offset from seesaw
wiz1y	82	Wizard 1 Y offset from seesaw
wiz2x	83	Wizard 2 absolute X position
wiz2y	84	Wizard 2 absolute Y position
wiz2xa	85	Wizard 2 X velocity
wiz2ya	86	Wizard 2 Y velocity
paws	87	Delay counter
r	8A	Used for random number
offset	8C	Horizontal offset for sprites
scrn	8D	Current screen number
numball	8E	Total number of balloons
numleft	8F	Number of balloons left
xy	1C30	Highscore data
envel1	1C40	Data for envelope 1
envel2	1C4E	Data for envelope 2
posy	1C5C	Bouncing wizard data
divtab	1C64	Divide by five table
bdata	1C79	Seesaw bounce data
windows	1C8D	Data for VDU 28 (.dowind)
rd	1CA1	Seed for random number
messages	1C80	The displayed messages
low	1DB0	Screen line start addresses (low)
high	1DD0	Screen line start addresses (high)
hinames	1DF0	High score names
loscore	1E70	High scores (low)
hiscore	1E78	High scores (high)
ballx	1EC0	X positions of balloons
bally	1F00	Y positions of balloons
ballc	1F40	Deflation and wobbling counter
ballm	1F80	Top bit indicates up or down movement
balld	1FC0	Top bit set means deflation
screens	2000	The screen designs
mask	2100	Wizard mask
seesaw	2200	One left seesaw, one right.
music	2300	The music
digits	24E0	Digits for displayed score
sprite	2580	The sprites

Turn to the yellow page index on page 113 for details of the Wizalon *listing.*

HAVE MICRO WILL TRAVEL

Clive Sinclair's new Z88 portable has much in common with the BBC micro. Just how useful is a computer on the move?

John Allen



Cambridge Computer's Z88 laptop runs a version of *View Professional*

Sir Clive Sinclair's new laptop computer, the Cambridge Computer Z88, is proving to be a popular machine, particularly as a business tool. The machine is based around a Z80 rather than the BBC micro's 6502 chip, so it comes as a surprise to find that it makes a useful add-on if you have a BBC micro.

Any compatibility between the machines is due to the software which is bundled with the Z88. The language included, BBC Basic, and the wordprocessor cum spreadsheet, *Pipedream,* both have their counterparts on the BBC micro. *Pipedream* was written by *View* author Mark Colton, and is almost identical to the BBC micro's *View Professional.* This means that the Z88's *Pipedream* files are indistinguishable from *View Professional* files on your BBC micro. So, provided you have *View Professional* on your BBC, files can be transferred either way and editing continued on the other machine. This can prove particularly handy if you want to check spelling, for as yet the Z88 has no spelling checker. You can also see a Z88 document on a larger screen before printing. In the reverse direction it allows you to continue with a document 'on the move' that you have started at home.

The Z88's BBC Basic is the standard version for the Z80 processor; it's very similar to the BBC Basic on the Acorn Z80 second processor. However, although the values of the tokens used in place of the keywords – PRINT, GOTO and so on, are the same, programs are stored slightly differently. So when you transfer Basic programs from one machine to the other, they'll not run immediately. But Basic files can be translated without a great deal of difficulty. The main differences between the two file structures are listed in the box on page 105. As far as the language itself is concerned the main difference between the two is that Z80 Basic reads and writes to data files in text form, whereas the 6502 version uses its own internal format. Also, on the Z88 the graphics, sound and analogue commands are missing.

There are no ADVAL, CLG, COLOUR, DRAW, ENVELOPE, GCOL, MODE, MOVE, PLOT or SOUND commands, and, as you would expect, the built in assembler is for the Z80 processor. 'Commands like VDU, OSCLI, CALL and USR can be used on the Z88, but they don't necessarily have the same effect as on the BBC micro. Indirection operators like ? or ! can be used to look directly at the Z88's memory, but as the Z88 memory is allocated dynamically to the different built-in software applications, it is unlikely that peeking or poking particular addresses will prove very useful.

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Z88 BBC Basic does not have an editor. The only way to change a statement in Z88 Basic is to retype the entire line. This can be a real problem, and it can be quicker to write and debug a program on a BBC micro, then to transfer it to the Z88.

The Z88

Although this article is intended to look at how the Z88 can be used with the BBC micro rather than a review of the machine itself, it is necessary to have a quick look at its facilities.

It is a few millimetres smaller than the pages of this magazine and about 20mm high. It weighs about a kilogram and runs on four penlight batteries. The batteries last for around 20 hours, or up to a year on standby - you never switch the Z88 off.

The screen is a dark blue on silver, with an eight line liquid crystal display and is quite easy to read.

The keyboard is made of rubber, very quiet and comfortable to use. The keys are arranged differently from the BBC so, for example, the cursor keys are at the bottom right and the Delete key at the top right. To start with, you tend to hit quite a few wrong keys, but you can speed up and type surprisingly accurately.

The machine comes with 32k of RAM, of which about 18k is available. This is split between applications work space and file storage. Three slots at the front allow you to add extra RAM and EPROM cartridges, which currently come in 32k and 128k sizes. The RAM cartridges are not just for file storage; the Z88 can use all of the available memory as if it were built-in.

For most sensible uses of the machine you are going to need at least 32k of extra RAM. The standard memory has about enough space to save two pages of text from *Pipedream* and transmit it to the BBC micro. With an expansion cartridge you can create documents which are too large to be loaded into memory on a BBC micro even in a shadow mode.

Besides BBC Basic and *Pipedream*, the Z88 also has a diary, calendar, clock, alarm, calculator, terminal and import and export software. Access to these is via a system of menus, or by commands invoked with special 'square' and 'diamond' keys.

On the Z88, unlike the BBC micro, you have to specifically finish with an application to lose your work. If you don't kill it, it goes into suspension, and you can pick up your work later, even after switching off.

As the machine holds things suspended in memory, crashes can be catastrophic. In a couple of months of use, the only ones experienced were while programming in Basic, and they were my own fault. Developing a program with error trapping using ON ERROR GOTO hung the machine when the program encountered an unexpected error. This is a second good reason why it might be more practical to develop programs on the BBC micro and then import them to the Z88. It's a sensible precaution to save any suspended activities in the files.

FILE COMPARISONS

- BBC micro files start with a carriage return, Z88 ones don't.
- BBC micro files have &FF after the end of the last line, while Z88 ones have &00, &FF and &FF.
- The three bytes after each carriage return, which give the line number and length of the line, are stored in reverse order on the Z88.
- Leading spaces should be avoided in a Z88 BBC Basic statement.

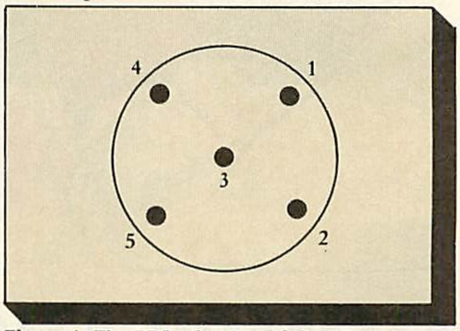


Figure 1. The BBC micro's serial port

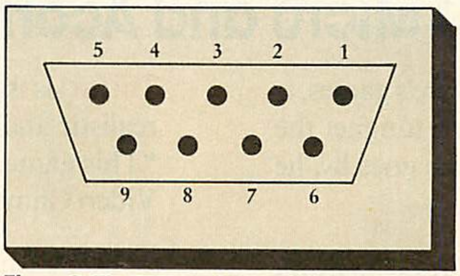


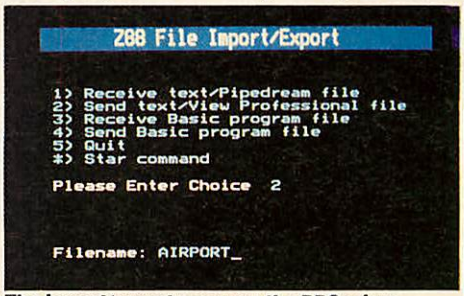
Figure 2. The Z88's serial port

Connection

The BBC micro and Z88 can be used together in a fairly simple way. All that you need is a lead to connect them together and a program to run on the BBC micro which will send and receive files to match up with the import and export utility supplied with the Z88.

To allow the two computers to communicate with each other, the RS423 socket on the BBC micro has to be connected to the RS232 port on the right-hand side of Z88. The lead is fairly straightforward; most dealers should be able to make one up. Alternatively, make one up yourself. You will need a five-pin domino DIN plug, a nine-pin male D connector and about a metre of five-core cable.

Figure 1 (left) shows the pin layout of the DIN plug. It shows the pins as you look at the back of the plug; it's the view you get while soldering it together. One problem with this type of plug is that it can be inserted into the BBC micro's socket in two different ways, only one of which is right. When you've wired up the plug it's sensible to put a mark on the top of the sleeve, with a felt pen or a blob of correction fluid.



The import/export menu on the BBC micro

The plug at the Z88 end of the cable is shown in figure 2 (left). The Z88's nine-pin socket has extra functions which can be useful for connection to printers, modems or other computers. But only the equivalents of the five on the BBC micro socket need to be connected up.

To wire the two plugs together, first connect the two earths to each other, then the transmit pins on one to the receive pins on the other. The full pin-to-pin connections are shown in figure 3 (on page 107). It is important to wire pins eight and nine together on the Z88 plug, otherwise the Z88 will ignore all of the data sent to it.

The Z88 comes with a VT52 terminal emulator so if you have a VT52 terminal program for the BBC micro, *Termulator* or *Termi 2* for example, you can check the connections. Set the baud speed on the Z88 to match that used by the BBC terminal using the panel utility from the main index menu. Then enter the terminal program on each computer. If all is well, anything typed on the Z88 keyboard will appear on the BBC screen, and anything typed on the BBC will appear on the Z88 display.

If the lead only works from the BBC micro to the Z88 check that the Z88's TX and CTS pins are correctly connected to the RX and RTS pins on the BBC micro. If it only works in the other direction, first check that you've connected pins eight and



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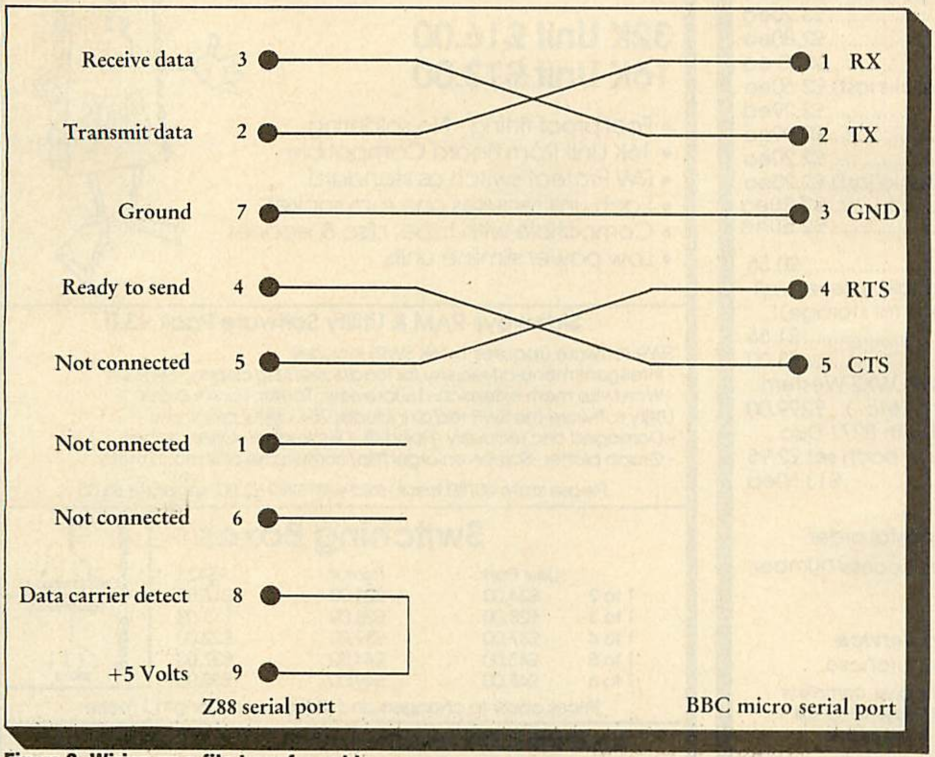


Figure 3. Wiring up a file transfer cable

nine together on the Z88's plug. Otherwise the problem probably lies with the Z88's RX and RTS lines. If it works in neither direction, try putting the BBC plug in the other way round.

Transfer software

Once the serial link is working, there remains the problem of transferring both Basic and *Pipedream* files to and fro. The Basic program for the BBC micro, the listing on page 109 allows you to transfer text files and Basic programs between the two machines. The maximum size of file which can be transferred depends on the particular model of BBC micro and the filing system that you are using. On a model B with the Acorn DFS this is around 20 kilobytes.

Type in the listing on the BBC micro. No extra software is needed on the Z88, because this has built-in file transfer software. To use the program first set both the Z88's transmit and receive speeds to 9600 bauds using the panel utility. It is also worth checking that the Z88 is set to ignore parity. Then enter the import and export utility on the Z88 and run the program on the BBC micro. Following the menus on each machine, you should set one to transmit a file and the other to receive. The BBC micro program is only able to send and receive single files, and will always save any files received in the current directory, using the first seven characters on the file's name from the Z88. Any embedded full stops in the Z88 name will be ignored, so if you transfer a file from a sub-directory on the Z88, it will simply be put in the current directory at the BBC micro's disc. In addition to the menu options one to five, the program also accepts star commands, so you can catalogue the disc or rename files normally.

Why transfer?

When *Pipedream* and *View Professional* files are transferred, the BBC files and Z88 files are identical. But with BBC Basic files, the program automatically takes account of the differing file structure used on the Z88, initial carriage return characters are added to or deleted from files, and the line number and length bytes are rearranged. Also any leading spaces in a BBC micro file are deleted before being transferred. Finally, the end of bytes in the file are modified to be appropriate for the destination machine. So once a program is transferred, it should be suitable for use on the other machine. At present, the only long term file storage method of the Z88 uses EPROMs. It works out rather costly if you want to keep any number of files – around £150 for the equivalent of an 80-track double-sided disc on the BBC. Probably the biggest advantage of transferring the files to the BBC is that you can store Z88 files on BBC discs. Stored files can then be reloaded onto the Z88 at a later date.

If you make use of *Pipedream* on the Z88, then having *View Professional* on your BBC micro is very useful. After transfer, *Pipedream* working files can be loaded directly into *View Professional* for further editing, printing or whatever. Any highlights and other effects you have put in the text will be preserved during the file transfer.

If you don't have *View Professional*, but do have *View*, you can save *Pipedream* files on the Z88 as plain text. Transferred text files can be loaded into *View* using the READ command. But this way, highlights and effects such as centring will be lost. Because *Pipedream* files are stored with Return characters at the end of each line, loading them into *Wordwise* or *InterWord* is not very useful. But *Wordwise Plus* could be used; a segment program could search for all of the Return characters and delete them.

View Professional comes with disc utilities which convert *View*, *ViewStore* and *ViewSheet* files into *View Professional* format. These can equally well be used to convert to *Pipedream* if, for example, you have a *ViewSheet* spreadsheet that you need to be able to carry around with you on your Z88.

After transfer to the BBC micro, *Pipedream* files can be loaded into *ViewSpell* to check spelling, or even checked using Computer Concepts' *SpellMaster* by loading the file into *SpellMaster*'s editor.

The transfer program on page 109 automatically handles the translation necessary for BBC Basic programs. Providing you stick to the commands that are common to both versions of Basic, the programs you transfer across will run straightaway on the other machine.

Indispensable

Until I tried using the Z88, I thought that a portable computer would be of little practical value. However, it was surprising just how soon I found it indispensable. On the BBC micro, *View Professional* is rather quirky and has some limitations if you use it as a main wordprocessor, but in its *Pipedream* form on a portable, things are different, and the facilities are really more than adequate. It makes the Z88 a highly usable machine, and it's even more so now you can transfer files back and forth between it and the BBC micro.

The Z88 costs £250 plus VAT For details of distributors contact Cambridge Computer, Sydney House, Sussex Street, Cambridge CB1 1PA. Tel: (0223) 312216.

Turn over to page 109 for the Z88 file transfer listing.

File transfer listing, see page 103

```
10 REM Z88 file import/export
20 REM by John Allen
30 REM for BBC B/B+/M/C
40 REM (C) Acorn User January 1988
50 :
60 *FX 3,0
70 *FX 2,0
80 *FX 15,0
90 MODE 7
100 double$=CHR$(132)+CHR$(157)+CHR$(141)+CHR$(131)
110 single$=CHR$(134)
120 buflen%=HIMEM-LOMEM-&400
130 DIM osc% 80, buffer% buflen%
140 buffer%=buffer%+1
150 :
160 FOR I% = 0 TO 1
170 PRINT TAB(0,1+I%); double$; SPC(4); "Z88 File Import/Export"
180 NEXT
190 PRINT TAB(1,6); single$; "1) Receive text/Pipedream file"
200 PRINT TAB(1,7); single$; "2) Send text/View Professional file"
210 PRINT TAB(1,8); single$; "3) Receive Basic program file"
220 PRINT TAB(1,9); single$; "4) Send Basic program file"
230 PRINT TAB(1,10); single$; "5) Quit"
240 PRINT TAB(1,11); single$; "*) Star command"
250 REPEAT
260 PRINT TAB(2,13); "Please Enter Choice ";
270 REPEAT:a$=GET$:UNTIL INSTR("12345*",a$)<>0
280 PRINT single$; a$;
290 IF a$ = "1" THEN basic%=FALSE:PROCimport
300 IF a$ = "2" THEN basic%=FALSE:PROCexport
310 IF a$ = "3" THEN basic%=TRUE:PROCimport
320 IF a$ = "4" THEN basic%=TRUE:PROCexport
330 IF a$ = "5" THEN PRINT TAB(2,13); "Import/Export Completed"':END
340 IF a$ = "*" THEN PROCstar
350 PRINT TAB(2,13); SPC(38)
360 UNTIL FALSE
370 :
380 DEF PROCstar
390 VDU 28,0,24,39,15,12,14
400 REPEAT
410 INPUT "*" command$
420 PROCoscli(command$)
430 PRINT '"  Press any key";
440 UNTIL GET$<>"*"
450 VDU 15,12,26
460 ENDPROC
470 :
480 DEF PROCoscli($osc%)
490 LOCAL X%,Y%
500 X%=osc%:Y%=osc% DIV 256
510 CALL &FFF7
520 ENDPROC
530 :
540 DEF PROCimport
550 *FX 229,1
560 *FX 7,7
570 *FX 2,1
580 C%=0
590 REPEAT UNTIL GET=27
600 IF GET<>78 THEN ENDPROC
610 REPEAT UNTIL GET=47
620 :
630 file$=""
640 REPEAT
650 byte$=GET$
660 IF byte$="/" THEN file$=""
670 IF (byte$<>".") AND (byte$<>CHR$(27)) THEN file$=file$+byte$
680 UNTIL byte$=CHR$(27)
690 IF GET<>70 THEN ENDPROC
700 file$=LEFT$(file$,7)
710 :
720 REPEAT
730 C%?buffer%=GET
740 C%=C%+1
750 UNTIL (buffer%?(C%-1)=27) OR (C%=buflen%)
760 IF C%=buflen% THEN PRINT TAB(0,22); CHR$(136); CHR$(129); file$; " is too long":GOTO 1030
770 REM deal with ESC codes
780 byte%=GET
790 IF (byte%=69) OR (byte%=90) THEN GOTO 900
800 IF byte%<>66 THEN GOTO 590
810 byte%=GET-48
820 IF byte%>9 THEN byte%=byte%-7
830 byte2%=GET-48
840 IF byte2%>9 THEN byte2%=byte2%-7
850 byte2%=(byte2% AND 15)+16*(byte% AND 15)
860 C%?(buffer%-1)=byte2%
870 GOTO 720
880 :
890 REM deal with Basic programs
900 IF NOT basic% THEN GOTO 1000
910 T%=buffer%-1
920 ?T%=&0D
930 REPEAT
940 byte%=?(T%+1)
950 IF byte%=0 THEN ?(T%+1)=&FF:T%=T%+2
960 IF byte%<>0 THEN ?(T%+1)=?(T%+3):?(T%+3)=byte%:T%=T%+?(T%+3)
970 UNTIL byte%=0
980 buffer%=buffer%-1:C%=T%-buffer%
990 :
1000 PROCoscli("SAVE "+file$+" "+STR$~(buffer%)+" "+STR$~(C%)+" 0 0")
1010 PRINT TAB(1,22); CHR$(130); "** ";file$;" imported **"
1020 IF basic% THEN buffer%=buffer%+1
1030 *FX 2,0
1040 *FX 229,0
1050 ENDPROC
1060 :
1070 DEF PROCexport
1080 PRINT TAB(2,18); "Filename:";CHR$(134);
1090 INPUT "" file$
1100 handle%=OPENIN file$
1110 IF handle%=0 THEN PROCerror(1):ENDPROC
1120 fillen%=EXT# handle%
1130 CLOSE# handle%
1140 IF fillen%>buflen% THEN PROCerror(2):ENDPROC
1150 *FX 8,7
1160 *FX 3,7
1170 PROCoscli("LOAD "+file$+" "+STR$~(buffer%-1))
1180 VDU 27,78
1190 PRINT file$;
1200 VDU 27,70
1210 :
1220 REM deal with Basic programs
1230 IF NOT basic% THEN GOTO 1320
1240 T%=buffer%-1
1250 REPEAT
1260 byte%=?(T%+1)
1270 IF (byte%<>&FF) AND (?(T%+4)=32) THEN REPEAT:FOR I%=T%+4 TO buffer%+fillen%-3 STEP 4:!I%=I%!1:NEXT:?(T%+3)=?(T%+3)-1:fillen%=fillen%-1:UNTIL ?(T%+4)<>32
1280 IF byte%=&FF THEN ?(T%+1)=0:?(T%+2)=&FF:?(T%+3)=&FF:fillen%=fillen%+2
1290 IF byte%<>&FF THEN ?(T%+1)=?(T%+3):?(T%+3)=byte%:T%=T%+?(T%+1)
1300 UNTIL byte%=&FF
1310 :
1320 IF basic% THEN C%=0 ELSE C%=-1
1330 REPEAT
1340 byte%=C%?buffer%
1350 IF (byte%>31) AND (byte%<128) THEN VDU byte% ELSE VDU 27,66,ASC(STR$~(byte% DIV 16)),ASC(STR$~(byte% MOD 16))
1360 C%=C%+1
1370 UNTIL C%=fillen%-1
1380 VDU 27,90
1390 *FX 3,0
1400 PRINT TAB(1,22); CHR$(130); "** "; file$;" exported **"
1410 PRINT TAB(2,18); SPC(38)
1420 ENDPROC
1430 :
1440 DEF PROCerror(n%)
1450 PRINT TAB(0,19); CHR$(136); CHR$(129); file$;
1460 IF n%=1 THEN PRINT " not found"
1470 IF n%=2 THEN PRINT " too long"
1480 PRINT TAB(2,21) "Press any key";
1490 REPEAT UNTIL GET
1500 PRINT TAB(2,18); SPC(38); TAB(0,19); SPC(40); TAB(0,21) SPC(40)
1510 ENDPROC
```









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YELLOW PAGES

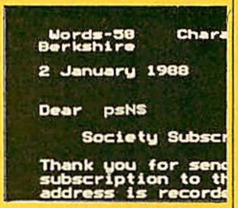
INDEX/COMPATIBILITY

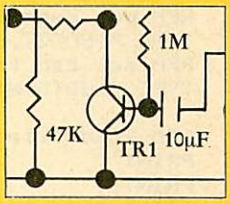
Entering listings

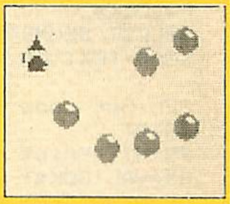
To make the task of entering listings easier, *Acorn User* has adopted several standards in the yellow pages. Programs are listed with line numbers in increments of 10, so type AUTO <Return> for automatic line numbering before you start. Before you list what you've entered, type LISTO 1 <Return> to provide spaces after the line numbers. Programs in the yellow pages are often listed to a width of 40 characters, so type MODE 6 <Return> before you start. Comparing the line-endings of your listing with the yellow pages will help you spot extra or missing characters.

To make sure that the program you want to enter will work on your particular machine, check the index below. All the listings work with Basic 1, 2 and 4 (unless stated otherwise) and with operating systems OS1.2 or above. If a program is accompanied by an article, please read the article first. If special care is needed when entering, we provide an easy-to-complete 'How To Enter' box.

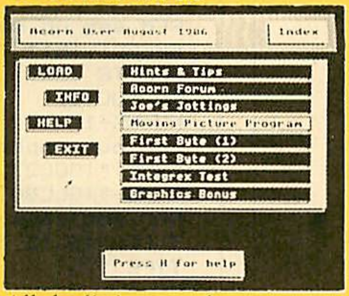
Once you've typed in your program, save it to tape or disc then test it by running it. If you have a major problem with a listing, ask someone to check it. If you still have difficulties, you can also send off for a list of *Checksums* which help you find the errors. Send a large sae (26p stamp) to *AU*Checksums, PO Box 641, London NW9 8TF.







DISCS AND TAPES



All the listings on these pages can be found on this month's listings disc or cassette. See page 129 for details of how to order.

BACK ISSUES





For help with entering and debugging listings see the following back issues: April '86, June '85, Aug '84, Sept '83.

Program	Page	BBC B	BBC B+/128	Master 128	Compact	Electron	65025P /Turbo	ADFS	Econet	Shadow RAM	Monthly T/D
Hints&Tips	114										
Listings 1-4[1]		■	■	■	■	■	■	■	■	■	■
First Byte	116										
Listings 1-3		■	■	■	■	■	■	■	■	■	■
Acorn Forum	117										
Listing 1		■	■			■	■	■	■	■	■
Joe's Jottings	118										
Listings 1-5		■[2]	■	■	■		■	■	■	■	■
Flying Wizards	122										
Listing 1		■	■	■	■	■[3]	■	■	■	■	■
Have Micro Will Travel	109										
Listing 1		■	■	■	■		■	■	■	■	■

1 Programs require *Wordwise Plus*, 2 Programs require shadow RAM 3 See conversion notes in the 'Flying Wizards' article

YELLOW PAGES

HINTS & TIPS

See Hints & Tips, page 41

Listing 1. Simple address printout

```
REM Hints & Tips -  Listing 1
REM By Martin Phillips
REM for B/B+/M/C/E with WW+
REM (c) Acorn User January 1988

REM initialise
REM O%=number of lines between labels
O%=2

REM set up main text area
SELECT TEXT
DELETE TEXT
DEFAULTS
REM put emphasised print code
TYPE "|GOC27,69|W"
REM set tab to suit label
TYPE "|GDT5|W|R4"

REM load file
PRINT
PRINT
PRINT "Enter filename: ";
F$=GLK$
SELECT SEGMENT 1
LOAD TEXT F$

REM Get code for labels
PRINT
PRINT "Print which code? ";
G%=VAL(GCK$)
IF G%>0 THEN PRINT G%
IF G%=0 THEN PRINT "all"
PRINT
PRINT "*** Please wait ***";

REPEAT
PROC input_address
SELECT SEGMENT 1
UNTIL EOT
SELECT TEXT
REM reset printer
TYPE"|GOC27,64|W"
PRINT TEXT
END


.input_address
SELECT SEGMENT 1
PROC getline
IF EOT THEN ENDPROC
C$=A$
C%=VAL(C$)
PROC getline
N$=A$
PROC getline
W$=A$
PROC getline
X$=A$
PROC getline
Y$=A$
PROC getline
Z$=A$
PROC getline
P$=A$
PROC getline
T$=A$
PROCstore
ENDPROC

.store
REM C% is the address code number
IF C%<>G% AND (G%>0 OR C%>0) THEN ENDPROC
SELECT TEXT
TYPE "|T"+N$
```

Continued ►

◄ Hints & Tips listing 1 continued

```
TYPE "|T"+W$
TYPE "|T"+X$
TYPE "|T"+Y$
TYPE "|T"+Z$
TYPE "|T"+P$
DOTHIS
TYPE "|R"
TIMES O%
ENDPROC

.getline
REPEAT
A$=GCT$
UNTIL A$=":" OR EOT
A$=GLT$+"|R"
ENDPROC
```

Listing 2. Printing several labels across the page

```
REM Hints & Tips -  Listing 2
REM by Martin Phillips
REM For B/B+/M/C/E with WW+
REM (c) Acorn User January 1988

REM initialise
CLOSE #0
REM N%=number of labels on line
N%=3
REM O%=number of lines between labels
O%=4
PROC clear

REM set up main text area
SELECT TEXT
DELETE TEXT
DEFAULTS
N%=N%-1
REM put emphasised print code
TYPE "|GOC27,69|W"
TYPE "|GLL80|W"
REM set tabs to suit labels
TYPE "|GDT5,30,55|W"
TYPE "|R"

REM Get filename
PRINT
PRINT
PRINT "Enter filename: ";
F$=GLK$

REM Get code for labels
PRINT
PRINT "Print which code? ";
G%=VAL(GCK$)
IF G%>0 THEN PRINT G%
IF G%=0 THEN PRINT "all"
PRINT
PRINT "*** Please wait ***";

F%=OPENIN F$
M%=0
L%=0
REPEAT
PROC input_address

UNTIL EOF#F%
IF M%>0 THEN PROC transfer
SELECT TEXT
REM reset printer
TYPE "|GOC27,64|W"
PRINT TEXT
CLOSE #F%
END
```

Continued ►

◄ Hints & Tips listing 2 continued

```
.input_address
PROC getline
IF EOF#F% THEN ENDPROC
C$=A$
C%=VAL(C$)
PROC getline
N$=A$
PROC getline
W$=A$
PROC getline
X$=A$
PROC getline
Y$=A$
PROC getline
Z$=A$
PROC getline
P$=A$
PROC getline
T$=A$
PROC store
ENDPROC

.store
REM C% is the code number
IF C%<>G% AND (G%>0 OR C%>0) THEN ENDPROC
IF M%<N% AND (L%>0ORM%>0) THEN CURSOR UP 5+O%
SELECT SEGMENT 1
CURSOR BOTTOM
TYPE "|T"+N$
SELECT SEGMENT 2
CURSOR BOTTOM
TYPE "|T"+W$
SELECT SEGMENT 3
CURSOR BOTTOM
TYPE "|T"+X$
SELECT SEGMENT 4
CURSOR BOTTOM
TYPE "|T"+Y$
SELECT SEGMENT 5
CURSOR BOTTOM
TYPE "|T"+Z$
SELECT SEGMENT 6
CURSOR BOTTOM
TYPE "|T"+P$
M%=M%+1
IF M%>N% THEN PROC transfer
ENDPROC

.getline
REPEAT
A$=GCF$#F%
UNTIL A$=":" OR EOF#F%
A$=GLF$#F%
IF LEN A$=0 THEN A$=" "
ENDPROC

.transfer
SELECT TEXT
TYPE SEGMENT 1
TYPE "|R"
TYPE SEGMENT 2
TYPE "|R"
TYPE SEGMENT 3
TYPE "|R"
TYPE SEGMENT 4
TYPE "|R"
TYPE SEGMENT 5
TYPE "|R"
TYPE SEGMENT 6
TYPE "|R"
DOTHIS
TYPE "|R"
TIMES O%
M%=0
L%=L%+1
```

Continued ►

◄ Hints & Tips listing 2 continued

```
PROC clear
ENDPROC

.clear
D%=1
DOTHIS
SELECT SEGMENT D%
DELETE TEXT
D%=D%+1
TIMES 6
ENDPROC
```

Listing 3. Print address list

```
REM Hints & Tips - Listing 3
REM by Martin Phillips
REM for B/B+/M/C/E with WW+
REM (c) Acorn User January 1988

REM set up main text area
SELECT TEXT
DELETE TEXT
DEFAULTS
TYPE "|GDT10,35|W|R"

REM load file
PRINT
PRINT
PRINT "Enter filename: ";
F$=GLK$
SELECT SEGMENT 1
LOAD TEXT F$

REM Get code for labels
PRINT
PRINT "Print which code? ";
G%=VAL(GCK$)
IF G%>0 THEN PRINT G%
IF G%=0 THEN PRINT "all"
PRINT
PRINT "*** Please wait ***";

REPEAT
PROC input_address
SELECT SEGMENT 1
UNTIL EOT
SELECT TEXT
PRINT TEXT
END

.input_address
SELECT SEGMENT 1
PROC getline
IF EOT THEN ENDPROC
C$=A$
C%=VAL(C$)
PROC getline
N$=A$
DOTHIS
PROC getline
TIMES 6
T$=A$
PROCstore
ENDPROC

.store
REM C% is the address code number
IF C%<>G% AND G%*C%>0 THEN ENDPROC
SELECT TEXT
TYPE "|T"+N$
TYPE "|T"
TYPE "Tele: "
TYPE T$+"|R"
ENDPROC
```

Continued ►

◀ Hints & Tips listing 3 continued

```
.getline
REPEAT
A$=GCT$
UNTIL A$=":" OR EOT
A$=GLT$
ENDPROC
```

Listing 4. Mailmerge program

```
REM Hints & Tips -  Listing 4
REM by Martin Phillips
REM for B/B+/M/C/E with WW+
REM (c) Acorn User January 1988

REM initialise
REM O%=number of lines between labels
O%=2

REM set up main text area
SELECT TEXT
DELETE TEXT
DEFAULTS
TYPE SEGMENT 9
CURSOR BOTTOM
TYPE "|GOC12,27,64|W"

REM load file
PRINT
PRINT
PRINT "Enter filename: ";
F$=GLK$
SELECT SEGMENT 1
LOAD TEXT F$

REM Get code for labels
PRINT
PRINT "Print which code? ";
G%=VAL(GCK$)
IF G%>0 THEN PRINT G%
IF G%=0 THEN PRINT "all"
PRINT
PRINT "*** Please wait ***";

REPEAT
PROC input_address
SELECT SEGMENT 1
UNTIL EOT
END

.input_address
SELECT SEGMENT 1
PROC getline
IF EOT THEN ENDPROC
C$=A$
C%=VAL(C$)
PROC getline
N$=A$
PROC getline
W$=A$
PROC getline
X$=A$
PROC getline
Y$=A$
PROC getline
Z$=A$
PROC getline
P$=A$
PROC getline
T$=A$
PROCstore
ENDPROC

.store
REM C% is the address code number
```

Continued ▶

◀ Hints & Tips listing 4 continued

```
IF C%<>G% AND (G%>0 OR C%>0) THEN ENDPROC
SELECT TEXT

PRINT TEXT
ENDPROC

.getline
REPEAT
A$=GCT$
UNTIL A$=":" OR EOT
A$=GLT$
ENDPROC
```

See First Byte, page 47

Listing 3. Creates a file of names

```
   10 REM First Byte Listing 3
   20 REM By Tessie Revivis
   30 REM For B/B+/M/C/E
   40 REM (C) Acorn User January 1988
   50 :
   60 ON ERROR CLOSE#0:REPORT:PRINT:END
   70 names=-1
   80 maxlen=0
   90 REPEAT
  100 READ name$
  110 names=names+1
  120 IF LEN name$>maxlen THEN maxlen=LE
N name$
  130 UNTIL name$=""
  140 file=OPENOUT "NAMES"
  150 RESTORE
  160 FOR count=1 TO names
  170 READ name$
  180 FOR char=1 TO maxlen
  190 IF char>LEN name$ THEN BPUT #file,
ASC" " ELSE BPUT #file,ASC (MID$(name$,c
har,1))
  200 NEXT
  210 NEXT
  220 CLOSE #file
  230 :
  240 file2=OPENIN "NAMES"
  250 REPEAT
  260 INPUT "Enter name number " name
  270 PTR #file2=maxlen*(name-1)
  280 FOR char=1 TO maxlen
  290 VDU BGET #file2
  300 NEXT
  310 PRINT '''
  320 UNTIL 0
  330 :
  340 DATA David,Bruce,Chris,Debbie,Dave
  350 DATA Isla,Jan,Sean
  360 DATA ""
```

See Acorn Forum, page 51

Listing 1. Binary constants in Basic

```
   10 REM Binary constan
ts in BASIC
   20 REM by Andrew Pisk
ozub
   30 REM for B/B+/E
   40 REM (c) Acorn User
 Jan 88
   50 :
   60 stringlen=&36
   70 stringacc=&600
   80 inta=&2A
   90 PROCsetup
  100 oswrch=&FFEE
  110 brkv=&202
  120 code%=&0C00
  130 :
  140 FOR pass=0 TO 3 ST
EP 3
  150 P%=code%
  160 [OPT pass
  170 .newbrk
  180 PHA
  190 TYA
  200 PHA
  210 LDY #0
  220 TXA
  230 PHA
  240 LDA (&FD),Y
  250 CMP #26
  260 BEQ newsymbol1
  270 .giveup
  280 PLA
  290 TAX
  300 PLA
  310 TAY
  320 PLA
  330 JMP (svbrkv)
  340 .svbrkv
  350 OPT FNequd(!brkv)
  360 .newsymbol1
  370 JSR getchb
  380 CMP #ASC("%")
  390 BNE newsymbol2
  400 LDA #0
  410 STA inta
  420 STA inta+1
  430 STA inta+2
  440 STA inta+3
  450 .again
  460 JSR getchb
  470 CMP #ASC("1")+1
  480 BCS 12
  490 CMP #ASC("0")
  500 BCC 12
  510 CMP #ASC("1")
  520 LDX #256-4
  530 .14
  540 ROL inta-256+4,X
  550 INX
  560 BNE 14
  570 BCC again
  580 BRK
  590 OPT FNequb(0)
  600 OPT FNequs("Binary
 too big")
  610 OPT FNequb(0)
  620 .wrongtype
  630 BRK
  640 OPT FNequb(6)
  650 OPT FNequs("Type m
ismatch")
  660 OPT FNequb(0)
  670 .12
  680 PLA
  690 PLA
  700 PLA
  710 PLA
  720 PLA
  730 PLA
  740 STY &1B
  750 LDA #&40
  760 RTS
  770 .newsymbol2
  780 CMP #ASC("£")
  790 BNE giveup
  800 JSR getnsb
  810 BEQ wrongtype
  820 BPL w1
  830 JSR cftoi
  840 .w1
  850 LDX #0
  860 .w2
  870 ROL inta
  880 ROL inta+1
  890 ROL inta+2
  900 ROL inta+3
  910 LDA #ASC("0")
  920 ADC #0
  930 STA stringacc,X
  940 INX
  950 CPX #32
  960 BNE w2
  970 LDX #0
  980 .w3
  990 LDA stringacc,X
 1000 CMP #ASC("0")
 1010 BNE w4
 1020 INX
 1030 CPX #32
 1040 BNE w3
 1050 LDX #1
 1060 STX stringlen
 1070 .finish
 1080 PLA
 1090 PLA
 1100 PLA
 1110 PLA
 1120 PLA
 1130 PLA
 1140 LDA #0
 1150 RTS
 1160 .w4
 1170 LDY #0
 1180 .w5
 1190 LDA stringacc,X
 1200 STA stringacc,Y
 1210 INY
 1220 INX
 1230 CPX #32
 1240 BNE w5
 1250 STY stringlen
 1260 JMP finish
 1270 .go
 1280 LDA #code% MOD 256
 1290 STA &202
 1300 LDA #code% DIV 256
 1310 STA &203
 1320 BRK
 1330 OPT FNequb(0)
 1340 OPT FNequs("OK")
 1350 OPT FNequb(0)
 1360 ]
 1370 NEXT
 1380 ?&202=code% MOD 25
6
 1390 ?&203=code% DIV 25
6
 1400 A$="*SAVE BINARY "
+STR$~code%+" "+STR$~P%+
" "+STR$~go+" "+STR$~cod
e%
 1410 PRINT A$
 1420 PRINT "Press a key
 to save"
 1430 IF GET
 1440 PROCoscli(A$)
 1450 PRINT '"To use, ty
pe '*BINARY' before aass
embling/running your pro
gram"
 1460 END
 1470 :
 1480 DEF PROCsetup
 1490 IF CHR$(?&8015)="1
" THEN PROCbasic1 : ENDP
ROC
 1500 IF CHR$(?&8015)="2
" THEN PROCbasic2 : ENDP
ROC
 1510 PRINT "This only w
orks with BBC BASIC Vers
ions 1 & 2"
 1520 END
 1530 :
 1540 DEF PROCbasic2
 1550 getnsb=&9B29
 1560 cftoi=&A3E4
 1570 getchb=&8A8C
 1580 ENDPROC
 1590 DEF PROCbasic1
 1600 getnsb=&9B03
 1610 cftoi=&A3F2
 1620 getchb=&8A13
 1630 ENDPROC
 1640 :
 1650 DEF PROCdemo
 1660 PRINT%101010101
 1670 PRINT£23232
 1680 PRINT£-1
 1690 PRINT£"Q":REM Gene
rates error
 1700 ENDPROC
 1710 :
 1720 DEF FNequb(b%)
 1730 ?P%=b%
 1740 P%=P%+1
 1750 =pass
 1760 :
 1770 DEF FNequw(b%)
 1780 ?P%=b% MOD 256
 1790 P%?1=b% DIV 256
 1800 P%=P%+2
 1810 =pass
 1820 :
 1830 DEF FNequd(b%)
 1840 !P%=b%
 1850 P%=P%+4
 1860 =pass
 1870 :
 1880 DEF FNequs(b$)
 1890 $P%=b$
 1900 P%=P%+LEN(b$)
 1910 =pass
 1920 :
 1930 DEF PROCoscli(stri
ng$)
 1940 DIM X% &FF
 1950 Y%=X% DIV 256
 1960 $X%=string$
 1970 CALL &FFF7
 1980 ENDPROC
```

JOE'S JOTTINGS

See Joe's Jottings, page 81

Listing 1. Handset test

```
   10 REM Infra red Hand
set test
   20 REM by Joe Telford
   30 REM for B with sha
dow RAM/B+/M/C
   40 REM (C) Acorn User
 January 1988
   50 :
   60 MODE 128
   70 DIM LCR% &100
   80 input=&FE60
   90 FOR pass=0 TO 3 ST
EP 3
  100 P%=LCR%
  110 [OPT pass
  120 .start
  130 LDY #1
  140 .up
  150 LDA input
  160 BPL zero
  170 LDA #49
  180 JMP op
  190 .zero
  200 LDA #48
  210 .op
  220 JSR &FFEE
  230 JMP up
  240 RTS
  250 ]
  260 NEXT
  270 PRINT "Press SPACE
 to run code"
  280 PRINT'"Press BREAK
 to exit"
  290 REPEAT UNTIL GET=3
2
  300 CALL start
```

Listing 2. Waveform decoder

```
   10 REM Remote Handset
 Wafeform decoder
   20 REM by Joe Telford
   30 REM for B with sha
dow RAM/B+/M/C
   40 REM (c) Acorn User
 January 1988
   50 :
   60 MODE 128
   70 DIM LCR% &100,onbu
f% &100,offbuf% &100
   80 input=&FE60
   90 on=40
  100 off=10
  110 s%=4
  120 cutoff=&40
  130 FOR pass=0 TO 3 ST
EP 3
  140 P%=LCR%
  150 [OPT pass
  160 .start
  170 LDY #1
  180 .up
  190 LDA input
  200 BMI up
  210 SEI
  220 .loop
  230 LDX #0
  240 .waitlo
  250 INX
  260 BNE over1
  270 JMP exit
  280 .over1
```

Continued ▶

◀ Joe's Jottings listing 2 continued

```
  290 OPT FNnops(off)
  300 LDA input
  310 BPL waitlo
  320 TXA
  330 STA onbuf%,Y
  340 LDX #0
  350 .waithi
  360 INX
  370 CPX #cutoff
  380 BMI over2
  390 JMP exit
  400 .over2
  410 OPT FNnops(on)
  420 LDA input
  430 BMI waithi
  440 TXA
  450 STA offbuf%,Y
  460 INY
  470 BEQ exit
  480 JMP loop
  490 .exit
  500 CLI
  510 DEY
  520 TYA
  530 STA onbuf%
  540 STA offbuf%
  550 RTS
  560 ]
  570 NEXT pass
  580 :
  590 REPEAT
  600 CLS
  610 FOR go=1 TO  20
  620 VDU7
  630 CALL start
  640 x%=0
  650 MOVE x%,50*go
  660 no=?onbuf%
  670 FOR x=1 TO no
  680 x%=x%+(x?onbuf%)*s
%
  690 DRAW x%,50*go
  700 DRAW x%,50*go-30
  710 x%=x%+(x?offbuf%)*
s%
  720 DRAW x%,50*go-30
  730 DRAW x%,50*go
  740 NEXT x
  750 A=INKEY(100)
  760 NEXT go
  770 A=GET
  780 CLS
  790 UNTIL A=13
  800 :
  810 DEF FNnops(n)
  820 IF n=0 THEN =pass
  830 FOR loop%=1 TO n
  840 [OPT pass
  850 NOP
  860 ]
  870 NEXT
  880 =pass
```

Listing 3. Handset information program

```
   10 REM Remote handset
 info saving program
   20 REM by Joe Telford
   30 REM for B with sha
dow RAM/B+/M/C
   40 REM (c) Acorn User
 January 1988
   50 :
   60 MODE 128
```

Continued ▶

◀ Joe's Jottings listing 3 continued

```
   70 bits=13
   80 first=2
   90 last=12
  100 on=1
  110 off=1
  120 cutoff=&80
  130 PROCsetup
  140 PROCmc
  150 :
  160 CLS
  170 keys=FNgetkeys
  180 DIM nos(keys)
  190 PROCteach(keys)
  200 PROCsavedefs
  210 END
  220 :
  230 REPEAT
  240 PRINT FNrespond(ke
ys)
  250 UNTIL 0
  260 :
  270 DEF PROCmc
  280 input=&FE60
  290 FOR pass=0 TO 3 ST
EP 3
  300 P%=LCR%
  310 [OPT pass
  320 .start
  330 LDY #1
  340 .up
  350 LDA input
  360 BMI up
  370 SEI
  380 .loop
  390 LDX #0
  400 .waitlo
  410 INX
  420 BNE over1
  430 JMP exit
  440 .over1
  450 OPT FNnops(off)
  460 LDA input
  470 BPL waitlo
  480 TXA
  490 STA onbuf%,Y
  500 LDX #0
  510 .waithi
  520 INX
  530 CPX #cutoff
  540 BMI over2
  550 JMP exit
  560 .over2
  570 OPT FNnops(on)
  580 LDA input
  590 BMI waithi
  600 TXA
  610 STA offbuf%,Y
  620 INY
  630 BEQ exit
  640 JMP loop
  650 .exit
  660 CLI
  670 DEY
  680 TYA
  690 STA onbuf%
  700 STA offbuf%
  710 RTS
  720 ]
  730 NEXT
  740 ENDPROC
  750 :
  760 DEF FNnops(n)
  770 IF n=0 THEN =pass
  780 FOR loop%=1 TO n
```

Continued ▶

► Joe's Jottings listing 3 continued

```
790 [OPT pass
800 NOP
810 ]
820 NEXT
830 =pass
840 :
850 DEF FNrx
860 LOCAL no,no%,mx,mn
,trig
870 CALL start
880 no=?onbuf%
890 IF no<>bits THEN =
0
900 mx=0
910 mn=255
920 FOR x=first TO las
t
930 IF mx<x?offbuf% mx
=x?offbuf%
940 IF mn>x?offbuf% mn
=x?offbuf%
950 NEXT x
960 trig=(mx+mn)DIV 2
970 no%=0
980 FOR x=first TO las
t
990 no%=no%*2
1000 IF x?offbuf%>=trig
no%=no%+1
1010 NEXT x
1020 =no%
1030 :
1040 DEF PROCsetup
1050 DIM LCR% &100
1060 DIM onbuf% &100
1070 DIM offbuf% &100
1080 ENDPROC
1090 :
1100 DEF FNgetkeys
1110 REPEAT
1120 INPUT "How many ke
ys on your Handset? "k
1130 UNTIL k>0
1140 =k
1150 :
1160 DEF PROCteach(k)
1170 LOCAL k1,k2,key
1180 FOR key=1 TO k
1190 PRINT "Press and h
old key ";key; " now"
1200 REPEAT
1210 k1=FNrx
1220 k2=FNrx
1230 UNTIL (k1=k2) AND
k1>0
1240 VDU7
1250 nos(key)=k1
1260 A=INKEY(100)
1270 NEXT
1280 ENDPROC
1290 :
1300 DEF FNrespond(k)
1310 LOCAL k1,key
1320 REPEAT
1330 ch=0
1340 k1=FNrx
1350 FOR key=1 TO k
1360 IF k1=nos(key) THE
N ch=key
1370 NEXT key
1380 UNTIL ch>0
1390 =ch
1400 :
1410 DEF PROCsavedefs
1420 PRINT "Please type
filename for this data(
5 letters max)"
1430 INPUT f$
1440 f$=f$+"D"
1450 ch%=OPENOUT(f$)
1460 PRINT #ch%,keys,bi
ts,first,last,on,off,cut
off
1470 FOR k=1 TO keys
1480 PRINT #ch%,nos(k)
1490 NEXT
1500 CLOSE #ch%
1510 ENDPROC
```

Listing 4. Data file printout

```
10 REM Utility for data-file printout
20 REM by Joe Telford
30 REM for B with shadow RAM/B+/M/C
40 REM (c) Acorn User January 1988
50 :
60 PROCloaddataset
70 PRINT "keys: "keys
80 PRINT "Bits: "bits
90 PRINT "first valid bit: ";first
100 PRINT "last valid bit: ";last
110 PRINT "mark delay in NOPS ";on
120 PRINT "space delay in NOPS ";off
130 PRINT "cutoff number = ";cutoff
140 FOR key=1 TO keys
150 PRINT "key ";key;" = ";nos(key)
160 NEXT
170 END
180 :
190 DEF PROCloaddataset
200 LOCAL char$,ch%,f$,k
210 INPUT "What is the Handset datafil
e called? "f$
220 char$=CHR$(ASC(RIGHT$(f$,1))AND 22
3)
230 IF char$<>"D" THEN f$=f$+"D"
240 ch%=OPENIN(f$)
250 INPUT #ch%,keys,bits,first,last,on
,off,cutoff
260 DIM nos(keys)
270 FOR k=1 TO keys
280 INPUT #ch%,nos(k)
290 NEXT k
300 CLOSE #ch%
310 ENDPROC
```

Listing 5. Noughts and crosses

```
10 REM Remote handset OXO
20 REM by Joe Telford
30 REM for B with shadow RAM/B+/M/C
40 REM (c) Acorn User January 1988
50 :
60 MODE 128
70 PROCloaddataset
80 PROCsetupmc
90 PROCmc
100 DIM oxo(9),player$(1)
110 MODE 130
120 PROCplayers
130 REPEAT
140 PROCinitialise
150 PROCscreen
160 REPEAT
170 score=FNgo
180 UNTIL score>0
190 PROCwinner(score)
200 UNTIL FNagain =2
210 CLS
220 END
230 :
240 DEF PROCloaddataset
250 LOCAL char$,ch%,f$,k
260 INPUT "What is the Handset datafil
e called? "f$
270 char$=CHR$(ASC(RIGHT$(f$,1))AND223
)
280 IF char$<>"D" THEN f$=f$+"D"
290 ch%=OPENIN(f$):INPUT#ch%,keys,bits
,first,last,on,off,cutoff
300 DIM nos(keys)
310 FOR k=1 TO keys
320 INPUT #ch%,nos(k)
330 NEXT k
340 CLOSE #ch%
350 ENDPROC
360 :
370 DEF PROCsetupmc
380 DIM LCR% &100
390 DIM onbuf% &100
```

Continued ►

◀ **Joe's Jottings listing 5 continued**

```
400 DIM offbuf% &100
410 ENDPROC
420 :
430 DEF PROCmc
440 input=&FE60
450 FOR pass=0 TO 3 STEP 3
460 P%=LCR%
470 [OPT pass
480 .start
490 LDY #1
500 .up
510 LDA input
520 BMI up
530 SEI
540 .loop
550 LDX #0
560 .waitlo
570 INX
580 BNE over1
590 JMP exit
600 .over1
610 OPT FNnops(off)
620 LDA input
630 BPL waitlo
640 TXA
650 STA onbuf%,Y
660 LDX #0
670 .waithi
680 INX
690 CPX #cutoff
700 BMI over2
710 JMP exit
720 .over2
730 OPT FNnops(on)
740 LDA input
750 BMI waithi
760 TXA
770 STA offbuf%,Y
780 INY
790 BEQ exit
800 JMP loop
810 .exit
820 CLI
830 DEY
840 TYA
850 STA onbuf%
860 STA offbuf%
870 RTS
880 ]
890 NEXT
900 ENDPROC
910 :
920 DEF FNnops(n)
930 IF n=0 THEN =pass
940 FOR loop%=1 TO n
950 [OPT pass
960 NOP
970 ]
980 NEXT
990 =pass
1000 :
1010 DEF FNrx
1020 LOCAL no,mx,mn,trig,no%
1030 CALL start
1040 no=?onbuf%
1050 IF no<>bits THEN =0
1060 mx=0:mn=255
1070 FOR x=first TO last
1080 IF mx<x?offbuf% mx=x?offbuf%
1090 IF mn>x?offbuf% mn=x?offbuf%
1100 NEXT x
1110 trig=(mx+mn)DIV 2
1120 no%=0
1130 FOR x=first TO last
1140 no%=no%*2
1150 IF x?offbuf%>=trig no%=no%+1
1160 NEXT x
1170 =no%
1180 :
1190 DEF FNrespond(k)
1200 LOCAL k1,key,ch
1210 ch=0
1220 REPEAT
1230 k1=FNrx
1240 FOR key=1 TO keys
1250 IF k1=nos(key) ch=key
1260 NEXT
1270 UNTIL ch>0
1280 SOUND 1,-10,53,2
1290 =ch
1300 :
1310 DEF PROCplayers
1320 COLOUR 132
1330 COLOUR 3
1340 GCOL0,5
1350 CLS
1360 PROCr(208,816,800,56,1)
1370 PRINT TAB(4,5);"The Players"
1380 PRINT TAB(1,10);
1390 INPUT "Whc is X? "player$(1)
1400 PRINT TAB(1,12);
1410 INPUT "Who is O? "player$(0)
1420 go=0
1430 ENDPROC
1440 :
1450 DEF PROCinitialise
1460 LOCAL ch%
1470 FOR ch%=1 TO 9
1480 oxo(ch%)=0
1490 NEXT
1500 ENDPROC
1510 :
1520 DEF PROCscreen
1530 LOCAL sc%
1540 COLOUR 132
1550 COLOUR 6
1560 GCOL 0,5
1570 CLS
1580 FOR sc%=0 TO 8
1590 PRINT TAB(((sc% MOD3)*5)+5,((sc% D
IV3)*8)+4);sc%+1
1600 NEXT sc%
1610 PROCr(0,734,1280,32,1)
1620 PROCr(0,484,1280,32,1)
1630 PROCr(490,250,32,770,1)
1640 PROCr(800,250,32,770,1)
1650 PROCr(0,250,1278,770,0)
1660 PROCr(4,254,1274,762,0)
1670 COLOUR 7
1680 GCOL 0,3
1690 ENDPROC
1700 :
1710 DEF FNgo
1720 go=1-go
1730 REPEAT
1740 PROCmess(player$(go))
1750 REPEAT
1760 ch=FNrespond(keys)
1770 UNTIL ch>0 AND ch<10
1780 IF oxo(ch)<>0 PROCused:UNTIL 0
1790 UNTIL oxo(ch)=0
1800 IF go=0 THENoxo(ch)=-1 ELSE oxo(ch
)=go
1810 PROCdraw(go,ch)
1820 =FNcheck
1830 :
1840 DEF PROCused
1850 PROCmess("already used!")
```

Continued ▶

◀ Joe's Jottings listing 5 continued

```
1860 SOUND 1,-10,0,10
1870 A=INKEY(100)
1880 ENDPROC
1890 :
1900 DEF FNcheck
1910 IF oxo(1)+oxo(2)+oxo(3)=3 THEN =1
1920 IF oxo(1)+oxo(2)+oxo(3)=-3 THEN =2
1930 IF oxo(4)+oxo(5)+oxo(6)=-3 THEN =2
1940 IF oxo(4)+oxo(5)+oxo(6)=3 THEN =1
1950 IF oxo(7)+oxo(8)+oxo(9)=3 THEN =1
1960 IF oxo(7)+oxo(8)+oxo(9)=-3 THEN =2
1970 IF oxo(1)+oxo(5)+oxo(9)=-3 THEN =2
1980 IF oxo(1)+oxo(5)+oxo(9)=3 THEN =1
1990 IF oxo(3)+oxo(5)+oxo(7)=3 THEN =1
2000 IF oxo(3)+oxo(5)+oxo(7)=-3 THEN =2
2010 IF oxo(1)+oxo(4)+oxo(7)=-3 THEN =2
2020 IF oxo(1)+oxo(4)+oxo(7)=3 THEN =1
2030 IF oxo(2)+oxo(5)+oxo(8)=3 THEN =1
2040 IF oxo(2)+oxo(5)+oxo(8)=-3 THEN =2
2050 IF oxo(3)+oxo(6)+oxo(9)=-3 THEN =2
2060 IF oxo(3)+oxo(6)+oxo(9)=3 THEN =1
2070 draw=3
2080 FOR loop%=1 TO 9
2090 IF oxo(loop%)=0 draw=0
2100 loop%=9
2110 NEXT
2120 =draw
2130 :
2140 DEF PROCdraw(g,c)
2150 LOCAL sx,sy
2160 PRINT TAB((((c-1)MOD3)*5)+5,(((c-1)DIV3)*8)+4);" "
2170 sx=((c-1)MOD3)*326+346
2180 sy=1024-(((c-1)DIV3)*258)-144
2190 IF g=1 PROCx(sx,sy) ELSE PROCo(sx,sy)
2200 ENDPROC
2210 :
2220 DEF PROCx(x,y)
2230 MOVE x,y:DRAW x-50,y-50:DRAW x+50,y+50
2240 MOVE x,y:DRAW x-50,y+50:DRAW x+50,y-50
2250 ENDPROC
2260 :
2270 DEF PROCo(x,y)
2280 LOCAL angle
2290 MOVE x+80*SIN(RAD(0)),y+80*COS(RAD(0))
2300 FOR angle=0 TO 360 STEP 18
2310 DRAW x+80*SIN(RAD(angle)),y+80*COS(RAD(angle))
2320 NEXT angle
2330 ENDPROC
2340 :
2350 DEF PROCwinner(s)
2360 IF s=1 PROCmess(player$(1)+" Has won!")
2370 IF s=2 PROCmess(player$(0)+" Has won!")
2380 IF s=3 PROCmess("Its a draw!!!!")
2390 PROCtune(s)
2400 ENDPROC
2410 :
2420 DEF PROCtune(s)
2430 IF s=1 RESTORE 2870
2440 IF s=2 RESTORE 2920
2450 IF s=3 RESTORE 2970
2460 PROCplay
2470 ENDPROC
2480 :
2490 DEF PROCplay
2500 REPEAT
2510 READ n$,t$
2520 IF n$<>"END" AND n$="R" SOUND1,0,0,FNrdur(t$)
2530 IF n$<>"END" AND n$<>"R" SOUND 1,-15,FNrdnotes(n$),FNrdur(t$)
2540 SOUND 1,0,0,1
2550 UNTIL n$="END"
2560 ENDPROC
2570 :
2580 DEF FNrdnotes(note$)
2590 LOCAL n$,n,I%
2600 n$=LEFT$(note$,1)
2610 n=INSTR("CDE",n$)*8
2620 IFn=0 n=INSTR("GAB",n$)*8+28
2630 IFn=28 n=0
2640 IFn$="F" n=28
2650 IFn=0 THEN =-1
2660 n=n+45
2670 n$=MID$(note$,2,1)
2680 IFn$="#" n=n+4
2690 IFn$="b" n=n-4
2700 FOR I%=2 TO LEN(note$)
2710 n$=MID$(note$,I%,1)
2720 IFn$="." n=n-48
2730 IFn$="'" n=n+48
2740 NEXT
2750 IFn>255 =-2
2760 IFn<0 =-3
2770 =n
2780 :
2790 DEF FNrdur(name$)
2800 LOCAL n$,n
2810 n$=LEFT$(name$,1)
2820 IF n$="." name$=MID$(name$,2,LENname$)
2830 n=INT(2^(INSTR("dsqcmsb",name$)-1))
2840 IF n$="." n=INT(n+n/2)
2850 =n
2860 :
2870 DATAC,q,E,q,F,q,G,m,C,q,E,q,F,q,G,m
2880 DATAC,q,E,q,F,q,G,c,E,c,C,c,E,c,D,m
2890 DATAE,q,E,q,D,q,C,m,E,c,G,c,G,q,F,m
2900 DATAE,q,F,q,G,c,E,c,C,c,D,c,C,m,END,END
2910 :
2920 DATAF,q,F,q,A,q,A,m,F,q,F,q,G,q,G,m
2930 DATAG,q,G,q,A,q,Bb,m,Bb,q,C',q,G,q,A,m
2940 DATAA,q,A,q,C',q,C',m,A,q,Bb,q,C',q,Bb,m
2950 DATAF,q,F,q,G,q,A,m,A,q,G,q,G,q,F,m,END,END
2960 :
2970 DATAA.,c,C,c,C,m,A.,c,G.,c,F.,m
2980 DATAG.,c,A.,c,C,c,A.,c,G.,sb
2990 DATAA.,c,C,c,C,m,A.,c,G.,c,F.,m
3000 DATAG.,c,A.,c,G.,c,F.,c,F.,sb,END,END
3010 :
3020 DEF FNagain
3030 PROCmess("Again..1 End..2")
3040 REPEAT
3050 A=FNrespond(16)
3060 UNTIL A=1 OR A=2
3070 =A
3080 :
3090 DEF PROCmess(t$)
3100 PRINT TAB(0,27);STRING$(20," ");
3110 PRINT TAB(10-(LENt$/2),27);t$;
3120 ENDPROC
```

Continued ▶

◄ Joe's Jottings listing 5 continued

```
3130 :
3140 DEF PROCr(x,y,l,w,f)
3150 MOVE x,y:DRAW x+1,y
3160 IF f=0 DRAW x+1,y+w ELSE PLOT 85,x
,y+w
3170 IF f=0 DRAW x,y+w ELSE PLOT 85,x+1
,y+w
3180 MOVE x,y+w
3190 IF f=0 DRAW x,y ELSE MOVE x,y
3200 ENDPROC
```

See Flying Wizards, page 96

Listing 1. *Wizalon* code

```
10 REM Wizards
20 REM By Dave Lawton
30 REM For B/B+/M/C
40 REM (C) Acorn User
January 1988
50 :
60 MODE 7
70 DIM osb 30
80 PROCvars
90 PROCcode
100 PROCcheck
110 PRINT"Saving..."
120 $osb="SAVE Game 11
00 "+STR$~P%
130 X%=osb MOD 256:Y%=
osb DIV 256
140 CALL &FFF7
150 END
160 :
170 DEF PROCvars
180 useful=0:maskaddr=
2:time=4
190 trid=6:diffx=8:dif
fy=9:at=&A
200 score=&C:tridlo=&1
0:count3=&11
210 count4=&12:x=&13:y
=&14:ytmp=&15
220 ypos=&16:num=&17:d
flate=&18
230 name=&20:read=&70:
write=&72
240 addr1=&74:addr2=&7
6:column=&78
250 line=&79:count1=&7
A:count2=&7B
260 bonus=&7C:tube=&7D
:sspos=&7E
270 temp=&7F:seeside=&
80:wiz1x=&81
280 wiz1y=&82:wiz2x=&8
3:wiz2y=&84
290 wiz2xa=&85:wiz2ya=
&86:paws=&87
300 vp=&88:r=&8A:offse
t=&8C:scrn=&8D
310 numball=&8E:numlef
t=&8F
320 xy=&1C30:envel1=&1
C40
330 envel2=&1C4E:posy=
&1C5C
340 divtab=&1C64:bdata
=&1C79
350 table=&1C89:window
s=&1C8D
360 rndplaytbl%=&1C99:
rd=&1CA1
370 messages=&1CB0:low
=&1DB0
380 high=&1DD0:hinames
=&1DF0
390 loscore=&1E70:hisc
ore=&1E78
400 ballh=&1E80:ballx=
&1EC0
410 bally=&1F00:ballc=
&1F40
420 ballm=&1F80:balld=
&1FC0
430 screens=&2000:mask
=&2100
440 seesaw=&2200:music
=&2300
450 bassp%=music:type%
=music+12
460 bass%=music+24:tun
e%=music+56
470 digits=&24E0:sprit
e=&2580
480 osbyte=&FFF4:oswor
d=&FFF1
490 oswrch=&FFEE:osasc
i=&FFE3
500 ENDPROC
510 :
520 DEF PROCcode
530 PRINT"Assembling..
."
540 FOR pass%=0 TO 2 S
TEP 2:P%=&1100
550 [OPT pass%
560 .start
570 LDX #envel1 MOD 25
6
580 LDY #envel1 DIV 25
6
590 LDA #8
600 JSR osword
610 LDX #envel2 MOD 25
6
620 LDY #envel2 DIV 25
6
630 LDA #8
640 JSR osword
650 LDA type%
660 JSR randplay
670 LDA #11
680 LDX #0
690 JSR osbyte
700 LDA #200
710 LDX #1
720 JSR osbyte
730 LDY #5
740 JSR domess
750 .gameloop
760 LDX #rd MOD 256
770 LDY #rd DIV 256
780 LDA #1
790 JSR osword
800 LDA #10
810 STA &FE00
820 LDA #255
830 STA &FE01
840 LDA #92
850 STA sspos
860 LDA #8
870 STA trid
880 LDA #9
890 STA tridlo
900 LDA #238
910 STA wiz1y
920 LDA #4
930 STA wiz2x
940 LDA #141
950 STA wiz2y
960 LDA #3
970 STA wiz2xa
980 LDA #0
990 STA seeside
1000 STA wiz1x
1010 STA wiz2ya
1020 STA paws
1030 STA score
1040 STA score+1
1050 STA bonus
1060 STA tube
1070 JSR add
1080 LDA #255
1090 STA scrn
1100 LDX #0
1110 JSR dowind
1120 LDX #4
1130 JSR dowind
1140 JSR dotube
1150 JMP levelone
1160 .screenloop
1170 JSR flashwiz
1180 LDA #7
1190 JSR showtime
1200 LDA time
1210 SEC
1220 SBC trid
1230 LSR A
1240 LSR A
1250 STA bonus
1260 .levelone
1270 LDA #238
1280 STA time
1290 INC scrn
1300 LDY #4
1310 JSR domess
1320 LDA scrn
1330 AND #15
1340 CLC
1350 ADC #65
1360 JSR oswrch
1370 LDX #8
1380 JSR dowind
1390 .dobonus
1400 LDA bonus
1410 BEQ donebonus
1420 DEC bonus
1430 LDA #1
1440 JSR add
1450 LDA #3
1460 JSR sync
1470 LDA trid
1480 CMP tridlo
1490 BCC nodectrid
1500 DEC trid
1510 .nodectrid
1520 LDA #0
1530 JSR showtime
1540 JMP dobonus
1550 .donebonus
1560 LDA trid
1570 STA tridlo
1580 INC tridlo
1590 LDX #0
1600 STX count3
1610 LDA scrn
1620 ASL A
1630 ASL A
1640 ASL A
1650 ASL A
1660 TAY
1670 .setball
1680 LDA #8
1690 STA count4
1700 LDA screens,Y'
1710 .setball2
1720 ASL A
1730 PHA
1740 BCC nosetball
1750 .getball
1760 JSR dotube
1770 LDA tube
1780 CMP #1
1790 BNE getball
1800 LDA count3
1810 AND #15
1820 ASL A
1830 ASL A
1840 ASL A
1850 ASL A
1860 STA ballx,X
1870 LDA count3
1880 AND #240
1890 ADC #32
1900 STA bally,X
1910 LDA #0
1920 STA balld,X
1930 LDA count3
1940 AND #7
1950 STA ballc,X
1960 LDA count3
1970 AND #1
1980 ASL A
1990 SEC
2000 SBC #1
2010 STA ballm,X
2020 LDA #6
2030 STA ballh,X
2040 LDA #0
2050 JSR showball
2060 INX
2070 .nosetball
2080 PLA
2090 INC count3
2100 DEC count4
2110 BNE setball2
2120 INY
2130 LDA count3
2140 BPL setball
2150 STX numball
2160 STX numleft
2170 JSR ssput
2180 JSR flashwiz
2190 .main
2200 LDA trid
2210 CLC
2220 ADC #15
2230 CMP time
2240 BCC notover
2250 .endbit
2260 LDA #2
2270 JSR showtime
2280 JMP highscore
2290 .notover
2300 LDA numleft
2310 BNE notend
2320 JMP screenloop
2330 .notend
2340 LDX #&8F
2350 JSR inkey
2360 BEQ endbit
2370 LDA paws
2380 AND #127
2390 BNE notick
2400 DEC time
2410 LDA #0
2420 JSR showtime
2430 .notick
2440 LDA #64
2450 STA offset
2460 .nodisable
2470 LDX #0
2480 .balloop
2490 JSR doballx
2500 LDA balld,X
2510 BMI nocollide
2520 LDA wiz2y
2530 SEC
2540 SBC bally,X
2550 STA diffy
2560 LDA wiz2x
2570 SEC
2580 SBC ballx,X
2590 STA diffx
2600 CLC
2610 ADC #6
2620 CMP #12
2630 BCS sideways
2640 LDA wiz2ya
2650 BPL goingup
2660 LDA diffy
2670 CLC
```

Continued ►

◄ **Flying Wizards listing 1 continued**

```
2680 ADC #16
2690 CMP #8
2700 BCS sideways
2710 DEC ballh,X
2720 BNE boingy
2730 LDA #1
2740 BNE burst
2750 .goingup
2760 LDA diffy
2770 SEC
2780 SBC #8
2790 CMP #8
2800 BCS sideways
2810 LDA #2
2820 .burst
2830 JSR add
2840 LDA #4
2850 STA ballc,X
2860 LDA #128
2870 STA balld,X
2880 .boingy
2890 JSR revy
2900 .sideways
2910 LDA paws
2920 AND #3
2930 BNE nocollide
2940 LDA diffx
2950 BIT wiz2xa
2960 BMI rightwards
2970 CLC
2980 ADC #12
2990 .rightwards
3000 CMP #12
3010 BCS nocollide
3020 .boingx
3030 LDA diffy
3040 CLC
3050 ADC #16
3060 CMP #20
3070 BCS nocollide
3080 JSR revx
3090 .nocollide
3100 INX
3110 CPX numball
3120 BEQ balldone
3130 JMP balloop
3140 .balldone
3150 LDA wiz1x
3160 CLC
3170 ADC sspos
3180 PHA
3190 LDA wiz1y
3200 PHA
3210 LDA wiz2x
3220 PHA
3230 LDA wiz2y
3240 PHA
3250 INC paws
3260 LDA paws
3270 AND #3
3280 BNE inair
3290 LDA wiz2x
3300 CLC
3310 ADC wiz2xa
3320 STA wiz2x
3330 SEC
3340 SBC #4
3350 CMP #236
3360 BCC changey
3370 JSR revx
3380 .changey
3390 LDA wiz2y
3400 SEC
3410 SBC wiz2ya
3420 STA wiz2y
3430 DEC wiz2ya
3440 CMP #232
3450 BNE inair
3460 JSR hitground
3470 .inair
3480 LDX #&9E
3490 JSR inkey
3500 BNE notz
3510 LDA sspos
3520 CMP #8
3530 BCC notz
3540 SBC #4
3550 STA sspos
3560 .notz
3570 LDX #&BD
3580 JSR inkey
3590 BNE notx
3600 LDA sspos
3610 CMP #188
3620 BCS notx
3630 ADC #4
3640 STA sspos
3650 .notx
3660 JSR getkey
3670 CPX #13
3680 BNE notshift
3690 JSR shift
3700 .notshift
3710 CPX #ASC"P"
3720 BNE notp
3730 .paused
3740 JSR play
3750 JSR getkey
3760 CPX #ASC"P"
3770 BNE paused
3780 .notp
3790 LDA #19
3800 JSR osbyte
3810 JSR ssput
3820 PLA:TAY
3830 PLA:TAX
3840 LDA paws
3850 AND #3
3860 BNE dontbl
3870 JSR showblankwiz
3880 .dontbl
3890 PLA:TAY
3900 PLA:TAX
3910 JSR showblankwiz
3920 LDX wiz2x
3930 LDY wiz2y
3940 LDA #3
3950 JSR showwiz
3960 LDA wiz1x
3970 CLC
3980 ADC sspos
3990 TAX
4000 LDA wiz1y
4010 TAY
4020 LDA #3
4030 JSR showwiz
4040 JMP main
4050 :
4060 .dotube
4070 TXA:PHA
4080 TYA:PHA
4090 JSR play
4100 LDA #0
4110 STA offset
4120 LDA tube
4130 CLC
4140 ADC #16
4150 .dotubeloop
4160 PHA
4170 TAY
4180 LDX #6
4190 LDA #0
4200 CPY #128
4210 BCC showtube
4220 LDA #2
4230 .showtube
4240 JSR showsprite
4250 PLA
4260 CLC
4270 ADC #16
4280 BCC dotubeloop
4290 DEC tube
4300 BPL notubewrap
4310 LDA #15
4320 STA tube
4330 LDX #6
4340 LDY #16
4350 LDA #7
4360 JSR showsprite
4370 .notubewrap
4380 PLA:TAY
4390 PLA:TAX
4400 LDA #64
4410 STA offset
4420 RTS
4430 :
4440 .doballx
4450 TXA
4460 EOR paws
4470 AND #7
4480 BNE skipball
4490 .doballx2
4500 LDA bally,X
4510 CMP #255
4520 BEQ skipball
4530 LDA balld,X
4540 BPL notdefl
4550 LDA #2
4560 JSR showball
4570 INC bally,X
4580 INC bally,X
4590 DEC ballc,X
4600 BNE skipball
4610 LDA #15
4620 JSR showball
4630 LDA #255
4640 STA bally,X
4650 DEC numleft
4660 JMP skipball
4670 .notdefl
4680 LDA bally,X
4690 CLC
4700 ADC ballm,X
4710 STA bally,X
4720 DEC ballc,X
4730 BPL leaveball
4740 LDA ballm,X
4750 EOR #254
4760 STA ballm,X
4770 LDA #7
4780 STA ballc,X
4790 .leaveball
4800 LDA ballc,X
4810 AND #2
4820 LSR A
4830 JSR showball
4840 .skipball
4850 RTS
4860 :
4870 .showtime
4880 PHA
4890 LDA #160
4900 STA offset
4910 PLA
4920 LDX #222
4930 LDY time
4940 JSR showsprite
4950 LDA #4
4960 LDX #222
4970 LDY trid
4980 JSR showsprite
4990 LDA #64
5000 STA offset
5010 RTS
5020 :
5030 .hitground
5040 LDA wiz2x
5050 CMP sspos
5060 BCC splat
5070 SEC
5080 SBC sspos
5090 TAX
5100 CMP #21
5110 BCC hitleft
5120 CMP #53
5130 BCS splat
5140 CMP #32
5150 BCS hitright
5160 :
5170 .splat
5180 JSR revy
5190 INC trid
5200 DEC wiz2ya
5210 DEC wiz2ya
5220 LDA wiz2ya
5230 CMP #2
5240 BCS nottoolow
5250 INC wiz2ya
5260 INC wiz2ya
5270 .nottoolow
5280 LDA #0
5290 JMP showtime
5300 :
5310 .hitleft
5320 LDA seeside
5330 BEQ splat
5340 LDA wiz2xa
5350 BMI nolr
5360 JSR revx
5370 .nolr
5380 STX useful
5390 LDA #20
5400 SEC
5410 SBC useful
5420 TAY
5430 LDA divtab,Y
5440 STA useful
5450 LDA wiz1x
5460 SEC
5470 SBC #32
5480 TAY
5490 LDA divtab,Y
5500 BNE nleftz
5510 LDY #&FF
5520 JSR inc2xa
5530 JMP nleft3
5540 .nleftz
5550 CMP #3
5560 BNE nleft3
5570 LDY #&FC
5580 JSR dec2xa
5590 .nleft3
5600 ASL A
5610 ASL A
5620 ORA useful
5630 JMP dobounce
5640 :
5650 .hitright
5660 LDA seeside
5670 BNE splat
5680 LDA wiz2xa
5690 BPL norr
5700 JSR revx
5710 .norr
5720 LDA #20
5730 SEC
5740 SBC wiz1x
5750 TAY
5760 LDA divtab,Y
5770 BNE nrightz
5780 LDY #1
5790 JSR dec2xa
5800 JMP nright3
5810 .nrightz
5820 CMP #3
5830 BNE nright3
5840 LDY #4
5850 JSR inc2xa
5860 .nright3
5870 ASL A
5880 ASL A
5890 STA useful
5900 TXA
5910 SEC
5920 SBC #32
5930 LDA divtab,Y
5940 ORA useful
5950 .dobounce
5960 TAY
5970 LDA #255
5980 SEC
5990 SBC wiz2ya
6000 CLC
6010 ADC bdata,Y
6020 STA wiz2ya
6030 CMP #20
6040 BCC nottoofast
6050 LDA #20
6060 STA wiz2ya
6070 .nottoofast
6080 CMP #2
6090 BCS speedok
6100 LDA #2
6110 STA wiz2ya
6120 .speedok
6130 LDA seeside
6140 EOR #128
6150 STA seeside
6160 LDA sspos
6170 CLC
6180 ADC wiz1x
6190 TAX
```

Continued ►

◀ Flying Wizards listing 1 continued

```
6200 LDA wiz2x
6210 SEC
6220 SBC sspos
6230 STA wiz1x
6240 STX wiz2x
6250 LDA #232
6260 STA wiz2y
6270 JMP calcy1
6280 :
6290 .inc2xa
6300 CPY wiz2xa
6310 BEQ incok
6320 INC wiz2xa
6330 .incok
6340 RTS
6350 .dec2xa
6360 CPY wiz2xa
6370 BEQ decok
6380 DEC wiz2xa
6390 .decok
6400 RTS
6410 :
6420 .shift
6430 LDA seeside
6440 EOR #&80
6450 STA seeside
6460 LDA #52
6470 SEC
6480 SBC wiz1x
6490 STA wiz1x
6500 .calcy1
6510 LDA #0
6520 STA useful
6530 LDA wiz1x
6540 CMP #4
6550 BCC nosub
6560 SEC
6570 SBC #4
6580 LSR A
6590 LSR A
6600 LSR A
6610 STA useful
6620 INC useful
6630 .nosub
6640 LDA seeside
6650 BEQ notrhs
6660 LDA #7
6670 SEC
6680 SBC useful
6690 STA useful
6700 .notrhs
6710 LDA #238
6720 SEC
6730 SBC useful
6740 STA wiz1y
6750 RTS
6760 :
6770 .revx
6780 LDA #0
6790 SEC
6800 SBC wiz2xa
6810 STA wiz2xa
6820 RTS
6830 :
6840 .revy
6850 LDA #255
6860 SEC
6870 SBC wiz2ya
6880 STA wiz2ya
6890 RTS
6900 :
6910 .inkey
6920 LDA #&81
6930 LDY #&FF
6940 JSR osbyte
6950 CPX #&FF
6960 RTS
6970 :
6980 .flashwiz
6990 LDA #10
7000 STA count3
7010 .wizards
7020 LDX #5
7030 LDY #6
7040 JSR starflash
7050 LDX #6
7060 LDY #5
7070 JSR starflash
7080 DEC count3
7090 BNE wizards
7100 LDX #7
7110 LDY #7
7120 :
7130 .starflash
7140 TXA
7150 PHA
7160 TYA
7170 PHA
7180 LDX #20
7190 .waitabit
7200 LDY #10
7210 .loopy
7220 JSR play
7230 DEY
7240 BNE loopy
7250 DEX
7260 BPL waitabit
7270 PLA
7280 LDX wiz2x
7290 LDY wiz2y
7300 JSR showsprite
7310 LDA wiz1x
7320 CLC
7330 ADC sspos
7340 TAX
7350 LDY wiz1y
7360 PLA
7370 JMP showsprite
7380 :
7390 .ssput
7400 LDA #0
7410 STA write+1
7420 LDA sspos
7430 ASL A
7440 ROL write+1
7450 ADC #&C0
7460 STA write
7470 LDA write+1
7480 ADC #&7D
7490 STA write+1
7500 LDX seeside
7510 LDY #0
7520 .putssloop
7530 LDA seesaw,X
7540 STA (write),Y
7550 INX
7560 INY
7570 BPL putssloop
7580 RTS
7590 :
7600 .showball
7610 STX useful
7620 STY useful+1
7630 PHA
7640 LDA bally,X
7650 TAY
7660 LDA ballx,X
7670 TAX
7680 PLA
7690 JSR showsprite
7700 LDX useful
7710 LDY useful+1
7720 RTS
7730 :
7740 .showblank
7750 LDA #7
7760 .showsprite
7770 JSR showsub1
7780 .lineloop
7790 JSR showsub2
7800 .columnloop
7810 LDX count1
7820 BEQ noloop1
7830 .loop1
7840 LDA (read),Y
7850 STA (addr1),Y
7860 INY
7870 DEX
7880 BNE loop1
7890 .noloop1
7900 LDX count2
7910 BEQ noloop2
7920 .loop2
7930 LDA (read),Y
7940 STA (addr2),Y
7950 INY
7960 DEX
7970 BNE loop2
7980 .noloop2
7990 DEC column
8000 BNE columnloop
8010 JSR nextline
8020 BNE lineloop
8030 RTS
8040 :
8050 .showblankwiz
8060 LDA #7
8070 .showwiz
8080 JSR showsub1
8090 .lineloopb
8100 JSR showsub2
8110 .columnloopb
8120 LDX count1
8130 BEQ noloop1b
8140 .loop1b
8150 LDA (addr1),Y
8160 AND (maskaddr),Y
8170 ORA (read),Y
8180 STA (addr1),Y
8190 INY
8200 DEX
8210 BNE loop1b
8220 .noloop1b
8230 LDX count2
8240 BEQ noloop2b
8250 .loop2b
8260 LDA (addr2),Y
8270 AND (maskaddr),Y
8280 ORA (read),Y
8290 STA (addr2),Y
8300 INY
8310 DEX
8320 BNE loop2b
8330 .noloop2b
8340 DEC column
8350 BNE columnloopb
8360 JSR nextline
8370 BNE lineloopb
8380 RTS
8390 :
8400 .nextline
8410 LDA write
8420 CLC
8430 ADC #608 MOD 256
8440 STA write
8450 LDA write+1
8460 ADC #608 DIV 256
8470 STA write+1
8480 DEC line
8490 RTS
8500 :
8510 .showsub1
8520 PHA
8530 LDA #mask DIV 256
8540 STA maskaddr+1
8550 TXA
8560 AND #3
8570 CLC
8580 ROR A
8590 ROR A
8600 ROR A
8610 STA maskaddr
8620 ADC #sprite MOD 25
6
8630 STA read
8640 PLA
8650 ADC #sprite DIV 25
6
8660 STA read+1
8670 .setptrs
8680 TXA
8690 AND #252
8700 STA write
8710 LDA #0
8720 ASL write
8730 ROL A
8740 STA write+1
8750 TYA
8760 LSR A
8770 LSR A
8780 LSR A
8790 TAX
8800 TYA
8810 AND #7
8820 STA count2
8830 CLC
8840 ADC low,X
8850 ADC write
8860 STA write
8870 LDA high,X
8880 ADC write+1
8890 STA write+1
8900 LDA write
8910 CLC
8920 ADC offset
8930 STA write
8940 LDA write+1
8950 ADC #0
8960 STA write+1
8970 LDA #8
8980 SEC
8990 SBC count2
9000 STA count1
9010 LDA #2
9020 STA line
9030 LDY #0
9040 RTS
9050 :
9060 .showsub2
9070 LDA write
9080 STA addr1
9090 CLC
9100 ADC #632 MOD 256
9110 STA addr2
9120 LDA write+1
9130 STA addr1+1
9140 ADC #632 DIV 256
9150 STA addr2+1
9160 LDA #4
9170 STA column
9180 RTS
9190 :
9200 .play
9210 PHA:TXA
9220 PHA:TYA
9230 PHA
9240 JSR voice
9250 LDX #249
9260 JSR adval
9270 BCC nobass
9280 .bass2
9290 LDA bassnote
9300 CLC
9310 ADC section
9320 TAX
9330 INC bassnote
9340 LDA bassnote
9350 CMP #8
9360 BNE notlastbass
9370 LDA #0
9380 STA bassnote
9390 INC bassbar
9400 LDA bassbar
9410 CMP #12
9420 BNE notlastbass
9430 LDA #2
9440 JSR rand
9450 STA env+1
9460 LDA #0
9470 STA bassbar
9480 LDA section
9490 CLC
9500 ADC #8
9510 AND #31
9520 STA section
9530 .notlastbass
9540 LDA bass%,X
9550 CMP #255
9560 BEQ bassrest
9570 LDY bassbar
9580 CLC
9590 ADC bassp%,Y
9600 TAX
9610 JMP bsound
9620 .bassrest
9630 LDX #0
9640 .bsound
9650 LDA #2
9660 LDY #4
9670 JSR sound
9680 .nobass
9690 PLA:TAY
```

Continued ▶

◀ Flying Wizards listing 1 continued

```
9700 PLA:TAX
9710 PLA
9720 RTS
9730 :
9740 .nextbar
9750 LDX voicebar
9760 INX
9770 CPX #12
9780 BNE nextbar2
9790 LDX #0
9800 LDA #2
9810 JSR rand
9820 STA env
9830 .nextbar2
9840 STX voicebar
9850 LDA type%,X
9860 JSR randplay
9870 .voice
9880 LDX #250
9890 JSR adval
9900 BCS voice2
9910 RTS
9920 .voice2
9930 LDY vp
9940 LDA tune%,Y
9950 CMP #255
9960 BEQ nextbar
9970 TAX
9980 INC vp
9990 LDA tune%+1,Y
10000 TAY
10010 INC vp
10020 LDA #1
10030 .sound
10040 STA block
10050 STX block+4
10060 STY block+6
10070 CPX #0
10080 BEQ rest
10090 TAX
10100 LDA env-1,X
10110 TAX
10120 INX
10130 .rest
10140 STX block+2
10150 .unrest
10160 LDX #block MOD 256
10170 LDY #block DIV 256
10180 LDA #7
10190 JMP osword
10200 :
10210 .adval
10220 LDA #128
10230 JSR osbyte
10240 CPX #3
10250 RTS
10260 :
10270 .rand
10280 STA r
10290 TXA
10300 PHA
10310 LDY #14
10320 .several
10330 LDA rd
10340 AND #3
10350 TAX
10360 LDA rd+1
10370 AND #127
10380 ORA table,X
10390 STA rd+1
10400 LSR rd+1
10410 ROR rd
10420 DEY
10430 BNE several
10440 PLA
10450 TAX
10460 LDA rd
10470 .reduce
10480 CMP r
10490 BCC rand2
10500 SBC r
10510 JMP reduce
10520 .rand2
10530 RTS
10540 :
10580 JSR rand
10590 CLC
10600 ADC rndplaytbl%+4,
X
10610 TAX
10620 LDY #0
10630 .getpointloop
10640 CPX #0
10650 BEQ gotpoint
10660 .skip
10670 LDA tune%,Y
10680 INY
10690 CMP #255
10700 BNE skip
10710 DEX
10720 BNE skip
10730 .gotpoint
10740 STY vp
10750 RTS
10760 :
10770 .dowind
10780 LDY #4
10790 LDA #28
10800 JSR oswrch
10810 .dowindloop
10820 JSR play
10830 LDA windows,X
10840 JSR oswrch
10850 INX
10860 DEY
10870 BNE dowindloop
10880 LDA #17
10890 JSR oswrch
10900 LDA #128
10910 JSR oswrch
10920 LDA #12
10930 JMP oswrch
10940 :
10950 .add
10960 STX x
10970 STY y
10980 CLC
10990 ADC score
11000 STA score
11010 STA useful
11020 LDA score+1
11030 ADC #0
11040 STA score+1
11050 STA useful+1
11060 JSR decimal
11070 TYA:TAX
11080 LDA #&30
11090 STA at+1
11100 LDY #0
11110 STY at
11120 JSR pokenum
11130 LDX score
11140 LDY score+1
11150 CPY hiscore+7
11160 BCC nottop
11170 BNE topscore
11180 CPX loscore+7
11190 BCS topscore
11200 .nottop
11210 LDX loscore+7
11220 LDY hiscore+7
11230 .topscore
11240 STX useful
11250 STY useful+1
11260 JSR decimal
11270 TYA:TAX
11280 LDA #&31
11290 STA at+1
11300 LDA #&F8
11310 STA at
11320 LDY #0
11330 JSR pokenum
11340 LDX x
11350 LDY y
11360 RTS
11370 :
11380 .pokenum
11390 TXA
11400 PHA
11410 LDA num,X
11420 JSR dodigit
11430 PLA
11440 TAX
11450 DEX
11460 BPL pokenum
11470 LDA #0
11480 .dodigit
11490 ASL A
11500 ASL A
11510 ASL A
11520 ASL A
11530 TAX
11540 LDA #16
11550 STA count3
11560 .pokeloop
11570 LDA digits,X
11580 STA (at),Y
11590 INY
11600 INX
11610 DEC count3
11620 BNE pokeloop
11630 TYA
11640 CLC
11650 ADC #8
11660 TAY
11670 RTS
11680 :
11690 .decimal
11700 LDY #0
11710 .numloop1
11720 LDX #16
11730 LDA #0
11740 .numloop2
11750 ASL useful
11760 ROL useful+1
11770 ROL A
11780 CMP #10
11790 BCC less
11800 SBC #10
11810 INC useful
11820 .less
11830 DEX
11840 BNE numloop2
11850 STA num,Y
11860 INY
11870 LDA useful
11880 ORA useful+1
11890 BNE numloop1
11900 .padit
11910 CPY #5
11920 BEQ donepad
11930 LDA #0
11940 STA num,Y
11950 INY
11960 BNE padit
11970 .donepad
11980 DEY
11990 RTS
12000 :
12010 .highscore
12020 JSR flashwiz
12030 LDX #0
12040 .setflags
12050 LDA #16
12060 STA ballc,X
12070 LDA #128
12080 STA balld,X
12090 JSR play
12100 INX
12110 CPX numball
12120 BNE setflags
12130 LDA #16
12140 STA dflate
12150 .deflateall
12160 LDA #4
12170 JSR sync
12180 LDX #0
12190 .deflateloop
12200 JSR play
12210 JSR doballx2
12220 INX
12230 CPX numball
12240 BNE deflateloop
12250 LDY #1
12260 JSR domess
12270 DEC dflate
12280 BNE deflateall
12290 LDA #192
12300 STA offset
12310 LDX #0
12320 .findhpos
12330 LDA score+1
12340 CMP hiscore,X
12350 BEQ same
12360 BCC gothigh
12370 .higher
12380 INX
12390 BNE findhpos
12400 .same
12410 LDA score
12420 CMP loscore,X
12430 BCS higher
12440 .gothigh
12450 CPX #0
12460 BNE entername
12470 JMP nohscore
12480 .entername
12490 LDY #0
12500 JSR domess
12510 .shdone
12520 DEX:TXA:PHA
12530 LDX #0
12540 STX useful
12550 STX useful+1
12560 STX ypos
12570 LDA #255
12580 STA ytmp
12590 .input
12600 LDA #19
12610 JSR osbyte
12620 LDX useful+1
12630 LDY ytmp
12640 JSR showblank
12650 INC ypos
12660 LDA ypos
12670 AND #7
12680 STA ypos
12690 TAY
12700 LDA posy,Y
12710 STA ytmp
12720 TAY
12730 LDX useful+1
12740 LDA #3
12750 JSR showsprite
12760 JSR play
12770 LDX #3
12780 LDY #0
12790 LDA #&81
12800 JSR osbyte
12810 BCS input
12820 CPX #127
12830 BEQ delete
12840 CPX #13
12850 BEQ return
12860 CPX #32
12870 BCC input
12880 CPX #127
12890 BCS input
12900 LDA useful
12910 CMP #16
12920 BEQ input
12930 TAY
12940 TXA
12950 STA name,Y
12960 PHA
12970 LDX useful+1
12980 LDY ytmp
12990 JSR showblank
13000 LDA #31
13010 JSR oswrch
13020 LDA useful
13030 CLC
13040 ADC #8
13050 JSR oswrch
13060 LDA #18
13070 JSR oswrch
13080 PLA
13090 JSR oswrch
13100 LDA useful+1
13110 CLC
13120 ADC #8
13130 STA useful+1
13140 INC useful
13150 BPL input
13160 .delete
13170 LDA useful
13180 BEQ input
13190 DEC useful
13200 LDX useful+1
```

Continued ▶

◀ Flying Wizards listing 1 continued

```
13210 LDY ytmp
13220 JSR showblank
13230 LDA useful+1
13240 SEC
13250 SBC #8
13260 STA useful+1
13270 JMP input
13280 .return
13290 LDX useful
13300 BNE realname
13310 .xyname
13320 LDA xy,X
13330 STA name,X
13340 INX
13350 CPX #16
13360 BNE xyname
13370 BEQ padded
13380 .realname
13390 LDA #32
13400 .padout
13410 CPX #16
13420 BEQ padded
13430 STA name,X
13440 INX
13450 BNE padout
13460 .padded
13470 PLA
13480 STA useful
13490 ASL A
13500 ASL A
13510 ASL A
13520 ASL A
13530 STA useful+1
13540 BEQ noshuffle
13550 LDX #0
13560 .shufscore
13570 LDA loscore+1,X
13580 STA loscore,X
13590 LDA hiscore+1,X
13600 STA hiscore,X
13610 INX
13620 CPX useful
13630 BNE shufscore
13640 LDX #0
13650 .shufnames
13660 LDA hinames+16,X
13670 STA hinames,X
13680 INX
13690 CPX useful+1
13700 BNE shufnames
13710 .noshuffle
13720 LDX useful
13730 LDA score
13740 STA loscore,X
13750 LDA score+1
13760 STA hiscore,X
13770 LDY #0
13780 LDX useful+1
13790 .stname
13800 LDA name,Y
13810 STA hinames,X
13820 INX
13830 INY
13840 CPY #16
13850 BNE stname
13860 .nohscore
13870 LDY #2
13880 JSR domess
13890 LDA #0
13900 STA x
13910 LDA #7
13920 STA count3
13930 LDA #5
13940 STA ypos
13950 LDA #44
13960 STA y
13970 .showtable
13980 LDX count3
13990 LDA loscore,X
14000 STA useful
14010 LDA hiscore,X
14020 STA useful+1
14030 LDA #31
14040 JSR oswrch
14050 LDA #1
14060 JSR oswrch
14070 LDA ypos
14080 JSR oswrch
14090 INC ypos
14100 INC ypos
14110 INC ypos
14120 TXA
14130 ASL A
14140 ASL A
14150 ASL A
14160 ASL A
14170 TAX
14180 LDY #16
14190 .showname
14200 LDA hinames,X
14210 JSR oswrch
14220 INX
14230 DEY
14240 BNE showname
14250 JSR decimal
14260 LDA #94
14270 STA x
14280 .showscr
14290 TYA
14300 PHA
14310 LDA num,Y
14320 JSR digit
14330 PLA
14340 TAY
14350 DEY
14360 BPL showscr
14370 LDA #0
14380 JSR digit
14390 LDA y
14400 CLC
14410 ADC #24
14420 STA y
14430 DEC count3
14440 BPL showtable
14450 LDY #3
14460 JSR domess
14470 .wait
14480 JSR getkey
14490 CPX #32
14500 BNE wait
14510 JMP gameloop
14520 :
14530 .getkey
14540 LDX #0
14550 JSR play
14560 LDY #0
14570 LDA #&81
14580 JMP osbyte
14590 :
14600 .sync
14610 PHA
14620 JSR play
14630 LDA #19
14640 JSR osbyte
14650 PLA
14660 SEC
14670 SBC #1
14680 BNE sync
14690 RTS
14700 :
14710 .digit
14720 LDX x
14730 LDY y
14740 PHA
14750 AND #3
14760 STA useful
14770 TXA
14780 AND #252
14790 CLC
14800 ADC useful
14810 TAX
14820 PLA
14830 LSR A
14840 LSR A
14850 CLC
14860 ADC #8
14870 JSR showsprite
14880 LDA x
14890 CLC
14900 ADC #16
14910 STA x
14920 RTS
14930 :
14940 .domess
14950 STY temp
14960 LDY #0
```

Continued ▶

◀ Flying Wizards listing 1 continued

```
14970 .findmess
14980 LDA temp
14990 BEQ foundmess
15000 .skipmess
15010 INY
15020 LDA messages-1,Y
15030 CMP #255
15040 BNE skipmess
15050 DEC temp
15060 BNE skipmess
15070 .foundmess
15080 LDA messages,Y
15090 CMP #255
15100 BEQ donemess
15110 JSR osasci
15120 INY
15130 BNE foundmess
15140 .donemess
15150 RTS
15160 :
15170 .voicebar
15180 BRK
15190 .basebar
15200 BRK
15210 .bassnote
15220 BRK
15230 .bassbar
15240 BRK
15250 .section
15260 BRK
15270 .env
15280 BRK:BRK:BRK
15290 .block
15300 BRK:BRK:BRK:BRK:BR
K:BRK:BRK:BRK
15310 ]:NEXT pass%
15320 env?1=1
15330 ENDPROC
15340 :
15350 DEF PROCcheck
15360 PRINT"Checking..."
15370 PROCsum("start","s
etball",23957)
15380 PROCsum("setball",
"inair",31604)
15390 PROCsum("inair","s
plat",32255)
15400 PROCsum("splat","i
nkey",29880)
15410 PROCsum("inkey","p
lay",40026)
15420 PROCsum("play","ad
d",38286)
15430 PROCsum("add","del
ete",42342)
15440 PROCsum("delete","
block",37870)
15450 ENDPROC
15460 :
15470 DEF PROCsum(S$,E$,
N%)
15480 T%=0
15490 FOR I%=EVAL(S$) TO
 EVAL(E$)
15500 T%=T%+?I%:NEXT
15510 IF T%=N% ENDPROC
15520 PRINT"Please check
 from ";S$;" to ";E$;"."
```

Listing 2. *Wizalon* data

```
 10 REM Wizards (data)
 20 REM By Dave Lawton
 30 REM For BBC B/B+/M/C
 40 REM (c) Acorn User January 1988
 50 :
 60 MODE 7
 70 FOR num%=1 TO 11
 80 PRINT"Data block ";num%;CHR$13;
 90 READ S$,L$
100 S%=EVAL("&"+S$):L%=EVAL("&"+L$)
110 T%=0:A$="":I%=0
120 REPEAT
130 IF A$="" READ A$
140 IF LEFT$(A$,1)="Z" B%=0 ELSE B%=EV
AL("&"+LEFT$(A$,2))
150 A$=MID$(A$,3+(B%=0))
160 S%?I%=B%:I%=I%+1:T%=T%+B%
170 UNTIL I%=L%
180 READ N$
190 IF T%<>EVAL("&"+N$) PRINT"Please c
heck data block ";num%:END
200 NEXT
210 PRINT'" - All data O.K."
220 *LOAD Game
230 PRINT" - Main code loaded"
240 *SAVE Wizalon 1100 3000
250 PRINT" - 'Wizalon' saved. Type *RU
N Wizalon to play!"
260 END
270 :
280 DATA 1C30,76
290 DATA 2D2D2058796C6F204472756D2120
300 DATA 2D2D0101ZZZ0101015AF8FDFD3C
310 DATA 3C020501FFZ0101015AZZF03C3C
320 DATA 969391909090919 3ZZZZ010101
330 DATA 010102020202020303030303Z
340 DATA ZFEFC0101FFFE020101Z0302ZZZ
350 DATA 8080ZZ1F0201251F2701041F2301
360 DATA 0C040202Z0C101226594131Z
370 DATA 16C7
380 :
```

Continued ▶

YELLOW PAGES

GAMES

◀ Flying Wizards listing 2 continued

```
390 DATA 1CB0,B4
400 DATA 0C1F0A0A57656C6C20646F6E6521
410 DATA 1F010C596F7527726520696E2074
420 DATA 686520686967682073636F726520
430 DATA 7461626C651F040E506C65617365
440 DATA 20656E7465722079F7572206E61
450 DATA 6D65203AFF1F0B0C47414D452020
460 DATA 4F564552FF0C1F090257697A6172
470 DATA 642053636F7265733AFF1F051D50
480 DATA 726573732053504143452074 6F20
490 DATA 706C61792E2E2EFF1A11811F0CZ
500 DATA 57697A616C6F6E2073637265656E
510 DATA 20FF160111810C13Z04ZZZ1301Z
520 DATA ZZZ130201ZZZFF
530 DATA 3454
540 :
550 DATA 1DB0,40
560 DATA Z80Z80Z80Z80Z80Z80Z80Z80Z80
570 DATA Z80Z80Z80Z80Z80Z80Z80303235
580 DATA 373A3C3F414446494B4E50535558
590 DATA 5A5D5F626467696C6E717376787B
600 DATA 7D
610 DATA 12D0
620 :
630 DATA 1DF0,90
640 DATA 2D2041782043616D656C68696465
650 DATA 202D2D204C6565204368616461 6D
660 DATA 6978202D2D204D61782048656164
670 DATA 6C696365202D2D20416C6578204D
680 DATA 6348616469 65202D2D2041786 56C
690 DATA 204D61646963686 5202D2D20416C
700 DATA 6963652044657868616D202D2D20
710 DATA 48696C6461204365786 16D65202D
720 DATA 2D204D69636861656C2045646178
730 DATA 202D193B8CC608528DC3ZZZ0101
740 DATA 0101
750 DATA 2AAC
760 :
770 DATA 2000,100
780 DATA ZZZZZZZ03C0ZZ03C0ZZZZZZZZ3C
790 DATA 3CZZ07E0ZZ3C3CZZ08101C382244
800 DATA 6BD622441C380810ZZZ03C04422
810 DATA 381C44222A54118BZZZZZ55542A
820 DATA AAZZ2AAA5554ZZZZZ018005A015
830 DATA A855AA55AAZZZZ44221008442210
840 DATA 084422ZZZZZ8001C003E7E703C0
850 DATA 0180ZZ07E00810142812481248 14
860 DATA 28081007E00C781CCC1CCC0CCC0C
870 DATA CC0CCC1E78ZZZZ3BDC4422ZZ3BDC
880 DATA 4422ZZZ081004200FF01BD83FFC
890 DATA 5FFA19980C300FF0300C481287E1
900 DATA 4812300C0FF0ZZZ738C4A527390
910 DATA 4A52738CZZZZ1FF807E019981E78
920 DATA 199807E01FF8ZZ1C38366C366C1E
930 DATA 3C060C0C181830ZZ
940 DATA 3843
950 :
960 DATA 2100,100
970 DATA FFFFFFFFFFEEBBBBDDDD8888ZZZ
980 DATA 88FFFFFFFF773377FFFFFFFFFFFF
990 DATA FFFFFFBBBBAA88EEEEFFFF88ZZZ
1000 DATA ZZAA22FF7733115533FF77FFFFFF
1010 DATA FFFFFFFFFFFFFFFFFFFFFFFDDDDEE
1020 DATA EECCCC88Z88CCFFFF7777331133
1030 DATA 77FFFFFFFFFFFFFFFFFDDDDDDCCFF
1040 DATA FFFFFFCC88ZZZZDD99773311Z22
1050 DATA 117733FFFFFFFFFFFFFFFFFFFFFF
1060 DATA FFFFFFEEEEFFFFEEEECC88CCEE77
1070 DATA 77333311Z1133FFFFFFFFFFFFFF
1080 DATA FFEEEEEEEEFFFFFFFFEECC88Z88
1090 DATA 88EECC3311ZZ11ZBB99FFFFFF77
1100 DATA 77FFFFFFFFFFFFFFFFFFFFFFFFFF
1110 DATA FFFFEECC6677BBBB1111ZZZ11FF
1120 DATA FFFFFFFF77FFFFFFFFFFFFFFFFFF
1130 DATA FF776644ZCCCCFFEE11ZZZZZ5544
1140 DATA FFFF7733BB77FFFF
1150 DATA B14E
1160 :
1170 DATA 2200,100
1180 DATA ZZZZZZZZZZZZZZZFFZZZZZZZFFZZ
1190 DATA ZZZZZFFZZZZZZFFZZZZZZZZFFZZZ
1200 DATA ZZZFFZZZZZZZZFF3377FFZZZFFCC
1210 DATA EEFFFFZZZFFZZZ88ZZFFZZZZZZZ
1220 DATA FFZZZZZZFFZZZZZZZZFFZZZZZZFF
1230 DATA ZZZZZZZZZZZZZZZZZZZZZZZZFFZZ
1240 DATA ZZZZZZFFZZZZZZZZFFZZZZZZZZFF
1250 DATA ZZZZZZZFFZZZZZZZZZFFZZZZZZZZFF
1260 DATA 113377FFZZZ88FFEEFFFFZZZZFF
1270 DATA ZZ88ZZZZZFFZZZZZZZFFZZZZZZZ
1280 DATA ZFFZZZZZZZZFFZZZZZZZZFFZZZZZ
1290 DATA ZZZ
1300 DATA 2783
1310 :
1320 DATA 2300,111
1330 DATA 3535353549493535214935 35ZZZ
1340 DATA Z0101ZZ0203ZZZFFZ10FF101CFF
1350 DATA 10ZFF10FFZ101CZFFFF10FFFF1C
1360 DATA 1CZ30Z1040101C1C9520FF6520FF
1370 DATA 9510Z0681048904FF6504610465
1380 DATA 046D04750481048904 9504FFA504
1390 DATA 9508B108B104B904C504FF810495
1400 DATA 0495089510FF9D04A504B108A504
1410 DATA B1088104FF75046508Z046510FF
1420 DATA 6518Z049D04FFA5049508950881
1430 DATA 02890295047504FF95019D019501
1440 DATA 9D0195019D0195019D019518FF9D
1450 DATA 04A1049D04A1049D04A1049D04A1
1460 DATA 04FF6510Z0881048904FF811089
1470 DATA 04810489049504FFA108A108A104
1480 DATA 950CFFA104A104A104A904A10495
1490 DATA 0489048104FF91109110FF91049D
1500 DATA 0891049D0C8104FF8904810C8904
1510 DATA 950CFF89049508890495 0C7504FF
1520 DATA FF
1530 DATA 59BB
1540 :
1550 DATA 24E0,A0
1560 DATA 7CF8E9E9E9E9F87CE1F07C7C7C7C
1570 DATA F0E13E7C7C1F1F1F7C7CC3C3C3C3
1580 DATA C3C3F0F07CF8E91F3E7CF8F8E1F0
1590 DATA F8E1C387F0F0F8F80FF8F80FF8F8
1600 DATA E1F07CF0F07CF0E1E9E9E9F87C0F
1610 DATA 0F0FE9E9E9F0F0E9E9E9F8F8E9F8
1620 DATA F80FF8F8F0F00FE1F07CF0E17CF8
1630 DATA E9F8F8E9F87CE1F00FE1F07CF0E1
1640 DATA F8F80F0F1F1F1F1FF0F07CE9C3C3
1650 DATA C3C37CF8E97CF8E9F87CE1F07CE1
1660 DATA F07CF0E17CF8E9F87C0FF87CE1F0
1670 DATA 7CF0F07CF0E1
1680 DATA 73EE
1690 :
1700 DATA 2580,800
1710 DATA ZZ10303070707 0ZF0F3F1F0F0F0
1720 DATA F0ZZ80C8C0E0E0E0ZZZZZZZZ3030
1730 DATA 10ZZ3344ZF0F0F0F02222CCZC0C0
1740 DATA 80ZZZZZZZZZZZZZZZZZ1010303030
1750 DATA Z70F1F0F0F0F0F0Z80C8ECE0F0F0
1760 DATA F0ZZZZZZZZ1010ZZZ1122ZF0F0F0
1770 DATA 70119966ZE0E0C080ZZZZZZZZZ
1780 DATA ZZZZZZZ101010Z3070F0F0F0F0F0
1790 DATA ZC0ECF6F0F0F0F0ZZZZZ808080Z
1800 DATA ZZZZZ11ZF0F07030ZCC33ZF0F0E0
1810 DATA C08888ZZZZZZZZZZZZZZZZZZZ10
1820 DATA 307070F0F0F0ZE0F6F3F0F0F0F0
1830 DATA ZZZ8080C0C0C0ZZZZZZZZZ707030
1840 DATA 10Z6699ZF0F0F0E044448 8Z8080
1850 DATA ZZZZZZZZ103070707070Z60F0F3
1860 DATA F1F0F0F0ZZ80C0E8E0E0E0ZZZZZ
```

Continued ▶

◀ Flying Wizards listing 2 continued

```
1870 DATA ZZZ703010Z2255ZZF0F0F06022CC
1880 DATA ZZE0C080ZZZZZZZZZZZZZZZZ1030
1890 DATA 303030Z30F0F1F0F0F0F0ZZC0E8
1900 DATA FCF0F0F0ZZZZZZZZ3010ZZ1122Z
1910 DATA ZF0F0F03011EEZZF0E0C0ZZZZZZ
1920 DATA ZZZZZZZZZZZ10101010Z1070F0F0
1930 DATA F0F0F0Z80E0FCF6F0F0F0ZZZZ80
1940 DATA 80808010ZZZZ11ZZF0F070108877
1950 DATA ZZF0F0E08088ZZZ80ZZZZZZZZZZ
1960 DATA ZZZZZZZ3070F0F0F0F0ZC0F0F6F3
1970 DATA F0F0F0ZZZ80C0C0C0C0ZZZZZZZZ
1980 DATA F07030Z44BBZZF0F0F0C04488ZZ
1990 DATA C080ZZZZZZZZZZZ101010ZZ60F0
2000 DATA F2F1F0F0ZZZZZ8080ZZZZZZZZZ10
2010 DATA ZZZZZ33ZE0E040404488ZZZZZZZ
2020 DATA ZZZZZZZZZZZZZZZZZZZZZ307071
2030 DATA F0F0F0ZZZ8080C8C080ZZZZZZZZ
2040 DATA ZZZZZZ11ZF0702020224488ZZZZ
2050 DATA ZZZZZZZZZZZZZZZZZZZZZZZ1030
2060 DATA 30707070ZZ80C0C8E4E0C0ZZZZZ
2070 DATA ZZZZZZZZZZZ703010101122CCZ80
2080 DATA 80ZZZZZZZZZZZZZZZZZZZZZZZZZ
2090 DATA 1010303030ZZC0E0E4F2F0E0ZZZ
2100 DATA ZZZZZZZZZZZZZ3010ZZZ1166ZC0
2110 DATA C0808088ZZZZZZZZZZZZZZZZ0144
2120 DATA 04020207070F0FFA77ZZZZ080C88
2130 DATA ZZZZZZZZZ040405670101ZZ070F
2140 DATA 0F0F0F0F55DDZ080C0E2A0CZ88Z
2150 DATA ZZZZZZZZZZZZZ22020101030307
2160 DATA 0F7533ZZ08080C0EC488ZZZZZZZ
2170 DATA Z02020233ZZZZ03070F0F0F0F22
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2290 DATA EE44ZZZZZZZZZZZZZZZZZ222222
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Continued ▶

◀ Flying Wizards listing 2 continued

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2610 DATA ZZFF772A0C08ZZZ88ZZZZZZZZZZ
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3170 DATA CCZ48C080ZZZZZZZZZZZZZ
3180 DATA B16F
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☐ MAY 0036-1	☐ JUN 0049-3	
☐ JUN 0037-X	☐ JUL 0050-7	
☐ JUL 0038-8	☐ AUG 0051-5	
☐ AUG 0039-6	☐ SEP 0052-3	
☐ SEP 0040-X	☐ OCT 0053-1	
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80-track 0970-9 ☐

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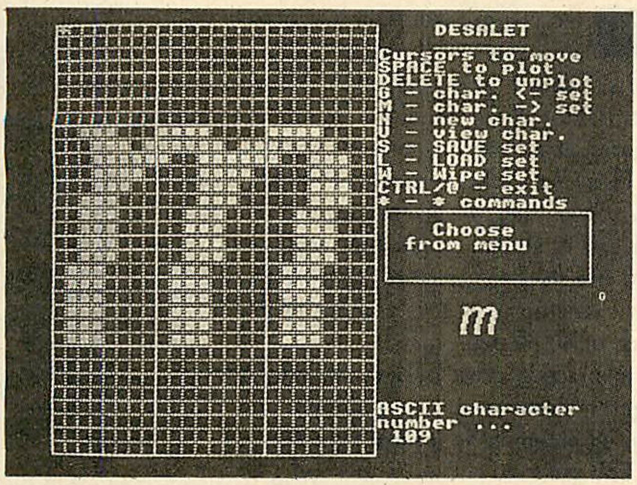
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B41

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OFFERS

C A L L I G R A P H Y



A new dimension in letter designing

BBC/B/ B+/M This is your chance to produce your own letterheads and posters to a professional standard, with the minimum of fuss and effort. *Acorn User's Calligraphy* disc has been compiled due to popular demand and contains all the programs needed to produce letter designs that will impress your friends and colleagues.

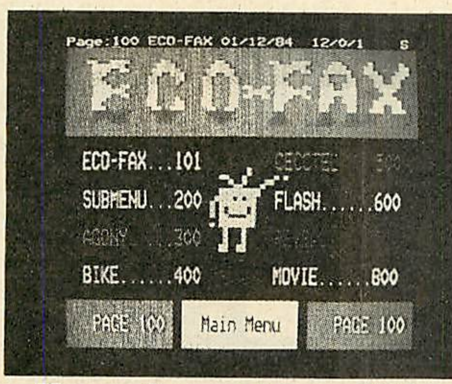
The *Desalet* program is a simple font creator which produces customised letters, to your personal design. It will save you from using repetitive data statements and error prone calculations. You can save your font set on disc and then call it up as needed. All previously saved sets can be modified or added to, and each set covers up to 94 characters.

Modical, a modification of the original *Calligraphy* program (September 1986 *Acorn User*) is also included on the disc. *Modical* allows the use of disc-based font sets created with *Desalet. Modical* also incorporates a modified file creation program, which permits files to be printed out immediately or saved for later printing.

An enhanced font ROM in the form of a sideways RAM image, is also on the disc. This allows you to design your own fonts for use on-screen. Any output to the printer will be in the new font – thus giving true WYSIWYG capabilities. There is a selection of new fonts to help you get started.

This superb disc comes in 5.25-inch, 40/80-track format and is great value at only £9.95.

E D U C A T I O N

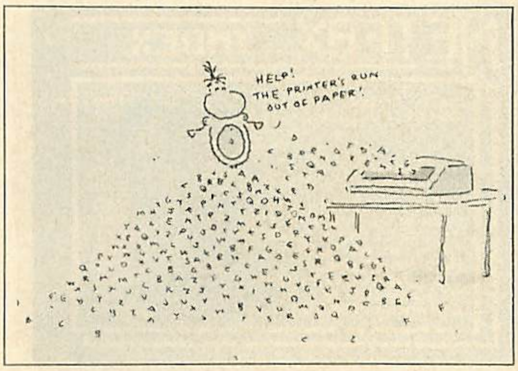


Easy learning with Education disc

BBC/B/ B+/M/ C The *Acorn User* Education disc makes learning easy and enjoyable. The disc is packed with useful programs, including the *Eco-fax* database for Econets.

Graphics are a strong feature, and included on the disc are *Turtle Logo, Easyplot* and *Bulletin,* and you can then show off your creations with *Vufoil* and *Noticeboard* or make music with *Tunemaker.* Also included are an all-mode dumping routine for Epson compatibles and a teletext dumping routine for mode 7 dumping to Epson FX80 compatibles. All this for only £7.95.

D I S C S



Printer advice with Printer Help disc

BBC/B/ B+/M/ C Often printer manuals don't fully cover the Master and BBC micro – our disc will help you to understand your printer's facilities for just £7.95.

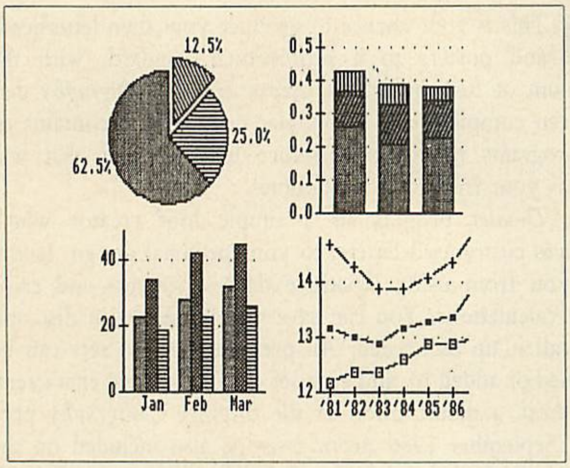
The 5.25-inch *Printer Help* disc illustrates various print type styles, use of *Wordwise* and *View,* screen images and printer care. There is an ASCII standard codes table and clear diagrams illustrating stages of printer use including advice on what to do if things go wrong.

For compatibility details write to Seran, Redwood Publishing Ltd, 20-26 Brunswick Place, London N1 6DJ.

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OFFERS

CHART SOFTWARE



Improve your presentation with ViewChart

BBC/B/B+/M/C Do you use your micro to prepare figures? Perhaps in *ViewSheet* or *ViewStore*? Do you make printed reports? This business graphics program from *Acorn User* contributor Peter Sandford is aimed at anyone who uses figures, and wishes to improve the quality of their work.

ViewChart takes your numeric data from a *ViewSheet* or *ViewStore* file, or manual input, and plots various chart formats to screen. In one plot you can produce between one and five piecharts, stacked bar charts up to 25 bars, grouped bar charts up to 24 bars and line graphs with up to five lines each of 40 plotted points.

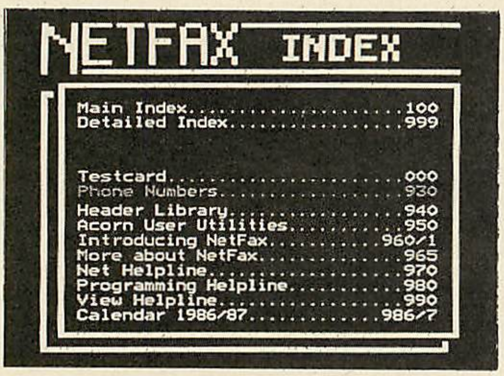
In practice, most business presentation data such as sales figures, departmental breakdowns, cost analyses and so on can be presented in a form even the boss will understand!

You can even add extra text and graphics to the completed chart prior to saving or printing. A screen dump program is provided, for Epson and compatible printers, which is specifically designed to fit the width of an A4 page. Instructions are provided on interfacing to other printers. *ViewChart* works in screen mode 0, using full shading effects, so what you see on screen is what you get on paper, and includes some tips on final presentation of graphics in documents.

ViewChart is supplied on 40-track 5.25-inch disc and works on the BBC models B and B+ and Master 128.

And the price of this professional software? Just £12.95.

DISCS



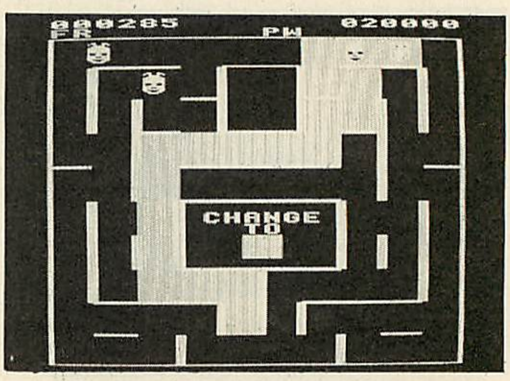
Network utilities for better communication

BBC/B/B+/M/C The *Network Utilities* 80-track disc is the logical addition to your network, combining invaluable routines with a sophisticated yet easy-to-use noticeboard.

Included is *Netfax*, our own hybrid information system providing access to thousands of pages of information. Other special features are: a file locator and directory size finder; network manager utilities including a bridge compatible screen viewer and a 'notify all' facility.

Plus there are 150 *Netfax* pages covering instructions, help and indexes, all on a 5.25-inch disc for £19.95.

CASSETTES



Games galore in our compendium cassette

BBC/B/B+/M/E You can guide Shuggy around his garden; puzzle over *Puzzle*, and be *3-D* amazed. Or destroy submarines with *Run Silent, Run Deep*. And for the really adventurous, go round the *Acorn User* office.

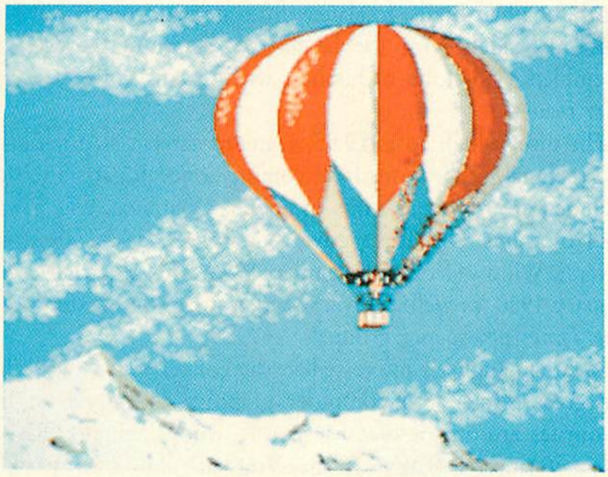
Best of all, try the truly different *Adventure* game written especially for the *Games Compendium* cassette by Rob Anderson. It's excellent value at £3.95.

You will also find David Acton's *Spectramania* and *Quadline* on this cassette: beat your micro, get four in a row. All are easily transferred to disc.

Acorn User order form on page 130 – 24 hour telephone service (0672) 40825

OFFERS

PROGRAM LISTINGS



Remote controlled wizards on disc and cassette

The ideal way to spend Boxing Day this year is to play our exceptional machine-code game *Wizalon*, written by Dave Lawton. The full version of the game is on both the cassette and disc.

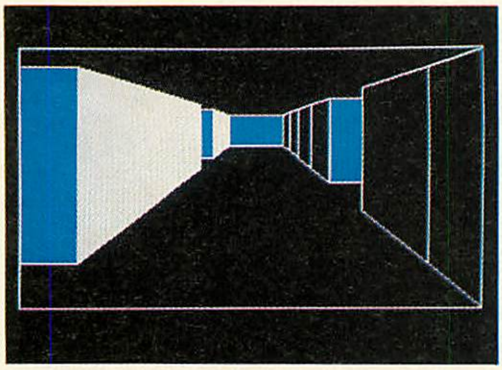
Joe's Jottings this issue shows how you can operate your computer programs from the comfort of your armchair with no more effort than pushing a button. This program allows you to use the remote control handset from your television to control your BBC micro.

John Allen has been busy producing a program that will enable the transfer of files between the BBC and Sir Clive Sinclair's new Z88 computer. Martin Phillip's Hints & Tips for the New Year shows you how to print labels and mail merge using *Wordwise Plus*, and it's a great example of the *Wordwise Plus* programming language.

First Byters get a hand from Tessie with three programs that demonstrate random access filing. For the games cheat, Mark De Weger and Forum have a software auto-fire button: no more frantic pressing of Return! And at last all programmers can use binary numbers as an extension to your Basic programming.

The programs are on 5.25-inch 40/80-track disc for £5.95 and on cassette for BBC and Electron users at only £3.95. To add to the festivities Phil Wilkes has produced some seasonal graphics as well.

LISTINGS



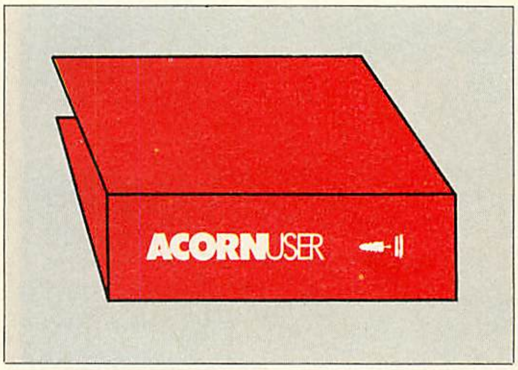
Special Christmas Subscriptions

Save up to £29 this Christmas by giving a monthly listings subscription as a gift. Every *Acorn User* monthly listings cassette or disc is packed with the very best programs, graphics and utilities.

For the Christmas period only we are offering a year's subscription to the *Acorn User* monthly discs for an unbeatable £40 – a saving of £29. And the price of a cassette subscription is a mere £35, saving £10.

But hurry we must have your order by January 31 1988! The offer is open to UK subscribers only.

BINDERS



Vastly reduced prices for disc binders

Our grey cloth disc binder is supplied with its own protective slip case and is filled with six transparent inserts, which will hold a year's supply of 5.25-inch monthly discs, and it is currently available at the special price of just £6.95.

An *Acorn User* magazine binder is the best way to keep your precious copies in pristine condition. Our smart red binder features a wide spine with the capacity to hold a whole year's issues. For only £4.95 your magazines can last a lifetime.

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OFFERS

PORTFOLIO DISC



A Portfolio of micro masterpieces

BBC/B/B+/M Jonathan Inglis, freelance illustrator and Acorn's artist-in-residence for the launch of the Master series, has assembled a portfolio of his best work exclusively for *Acorn User* readers.

The disc, which costs £9.95, contains screens that national and regional publications have commissioned Jonathan to do. Included are representations of Seurat's 'Bathers', which was used by *Time Out* for a cover, and two *Acorn User* front covers; Willow from November 1986 and Magician from January 1986, as well as several which were commissioned by *The Times* newspaper group.

Jonathan Inglis is interested in the conversion of work by the great master's to computer graphics, and three of his favourites are on the disc for you to enjoy: Seurat's 'Riverside', Vermeer's 'Lady at the Virginal' and a copy of a lithograph by Matisse.

Pixel Editor and *Super Painter* have been incorporated to let you create your own masterpieces. *Pixel Editor* allows you draw in and alter the minute detail while *Super Painter* enables you to draw lines, texture your screen and shade by mixing the eight standard colours.

The *Portfolio* disc comes in 80-track 5.25-inch format, and makes the ideal Christmas gift for the graphics fan. Enclosed with the disc is a comprehensive instruction sheet telling you more about the pictures and how the artist created them.

DISCS

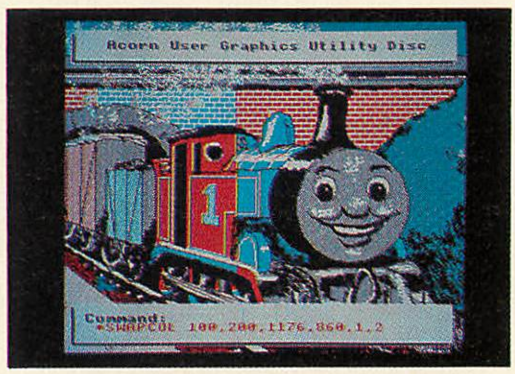


Disc for all sideways RAM users

BBC/B/B+/M/C The *Sideways RAM Utilities* disc includes: *Ram-Pad* – your computer's answer to the pad and pen. *On-Screen Fonts* – a variety of print styles available in all graphics modes. * HLP ROM – add your own help text to call up when you're stuck. Standard ROM header for use when writing your own ROMs. * RLOOK to examine the contents of your ROMs and sideways RAM images.

There are many more utilities on this 40-track 5.25-inch disc with a transfer program for 80-track users, and it's competitively priced at £9.95.

DISCS



Graphics utilities for your screens

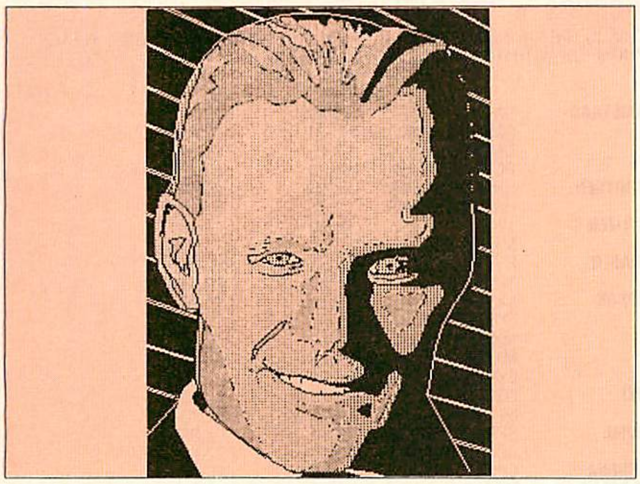
BBC/B/B+/M/C The 40-track 5.25-inch *Graphics Utilities* disc, keenly priced at £7.95, features 16 routines to manipulate blocks of graphics: rotation and reflection, a screen compressor/expander, a colour flood-fill routine and three mode conversion commands.

With the Basic procedure library are multi-height, proportional and justified text and 'drop shadow' boxes. A teletext screen editor gives point plotting, line drawing, rubber banding and flood fill, along with all mode 7 control codes. All can be used in your own programs.

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OFFERS

D U M P R O M S



Printer control with the UserDump ROM

BBC/B/ B+/M/ C/E

This pack includes the easy-to-fit *UserDump* ROM chip and a practical 22-page guide to the screen dump and printer control facilities offered – for just £19.95.

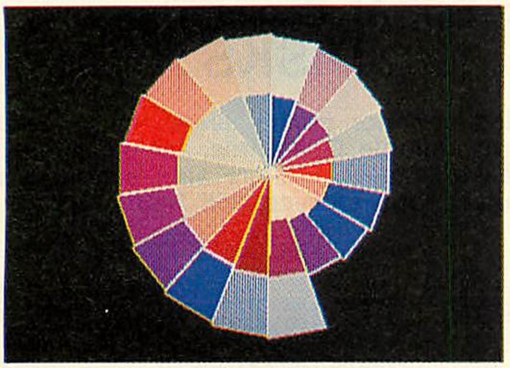
Once installed, *UserDump* will allow you to dump any screen image in any display mode by entering a single command – either as a line of your program or by typing in direct from the keyboard. A perfect dump can also be obtained while a machine code program is running.

UserDump features the following extra commands: *WDUMP – dump of graphics window only in any mode; *ZDUMP – a distortion-free dump of the mode 0 screen using plotter graphics; *TRANSIT – translate teletext screen into mode 1; *SHIFT ‹argument› – shift any area of memory; *IBM – select IBM printer; *CP80 – select CP80 printer.

UserDump is compatible with the BBC micro (model B or B+) fitted with operating system 1.2. Any earlier version will cause problems. *UserDump* is fully compatible with the Acorn 6502 second processor. It works with any printer which has single density and double density bit image graphics, including all Epson (LX, RX and FX) printers, Star Gemini and Delta, SG, SD and SR, Canon and Kaga NLQ. Also usable are the Shinwa and other CP80 printers.

There are many more commands available with *UserDump*, and details are available from Seran, Redwood Publishing Ltd., 20-26 Brunswick Place, London N1 6DJ.

R O M S



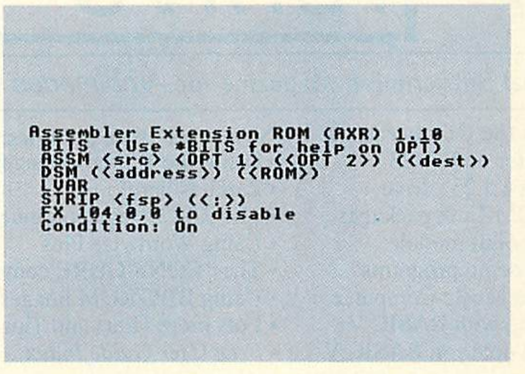
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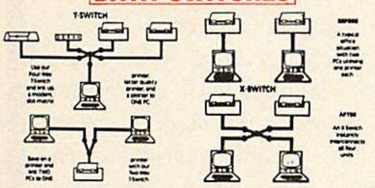
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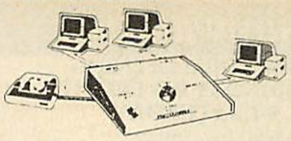
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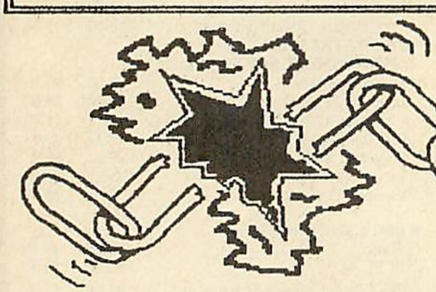
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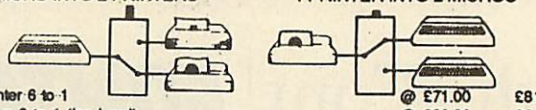
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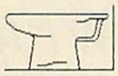



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REVIEWS

GAMES

THE GAMES PAGE

David Lawrence presents his round up of the best games of 1987 – and the worst!

A year ago I remember writing that games companies were aiming for quality rather than quantity. Well, over the last year, there has been no one policy on games releases – some companies seem to have tried for both; some neither.

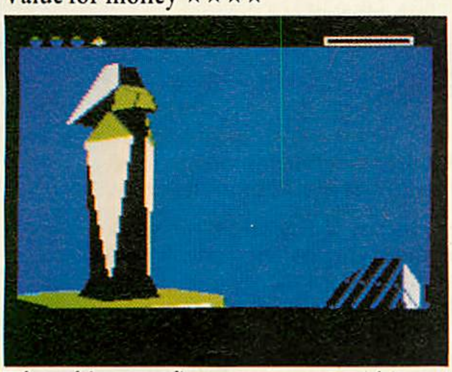
There were about 50 games that came to my attention this year; that's one a week, but Superior, Audiogenic and Tynesoft account for almost half of those.

I tried to pick my favourite 10 from these 50, not an easy task. It's a personal selection, and I'm sure that you'll disagree with some of with my choices.

In addition to my top 10 of 1987, I have five special mentions to make, more of which at the end of this article. But first, the games of 1987 . . .

1. *The Sentinel* (Firebird)

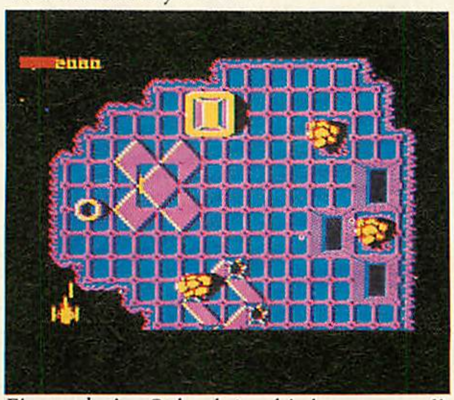
Graphics: ★★★★★
Addictiveness: ★★★★
Value for money ★★★★



When this game first came out, I said it was the best BBC micro game, excepting *Elite*. Well, I would still stick to this even though my second choice came very close. I still play *Sentinel*, and I've even stopped cheating. I am methodically working my way up from level 0000! The game is technically brilliant, with full 3-D solid views generated and rotated surprising quickly for an old 6502-based computer. Perhaps *Sentinel* is not everybody's cup of tea, but it certainly is mine!

2. *Firetrack* (Electric Dreams)

Graphics: ★★★★
Addictiveness: ★★★★
Value for money:★★★★



Firetrack is Orlando's third most well-known BBC micro game after *Zalaga* and *Frak*, and is undoubtedly the best shoot-em-up on the Beeb. Again the game is technically brilliant, apart from a disappointing end of level bonus, with smooth scrolling, numerous large, fast-moving aliens and finely detailed backgrounds. *Firetrack* is a game I regularly go back to, even if I do have to dig out my old Beeb – I haven't got a Master version yet.

3. *Starquake* (Bubblebus)

Graphics: ★★★★
Addictiveness: ★★★★
Value for money: ★★★★



It's nice to see new companies like Bubblebus on the BBC micro games scene. *Starquake* is a large graphic adventure very reminiscent of many Spectrum games. You control a robot, and it is your job to replace damaged pieces of a reactor. The action takes place inside a vast cave system inhabited by large and colourful aliens. *Starquake* is the sort of game that appeals to everyone, as it caters for both careful-thinking adventurers and key-thumping alien zappers.

4. *Impossible Mission* (US Gold)

Graphics: ★★★
Addictiveness: ★★★★
Value for money: ★★★

Peter Johnson must take the prize for the largest number of conversions from other machines to the BBC micro. *Impossible Mission* started life on the Commodore 64, and is the sort of game that looks difficult to rewrite for the BBC micro. This is because the Commodore machine has a display system with hardware sprite facilities which the BBC lacks. But the conversion features all the smooth animation, robot types and background details of the original – in fact, only speech and the tennis ball are missing. The game may seem complicated at first – you must search the furniture in a computer installation to collect pieces of punched card to find letters of a code word to defeat the evil Professor Atombender – but it is actually very easy to pick up and soon becomes very addictive.

5. *Ravenskull* (Superior Software)

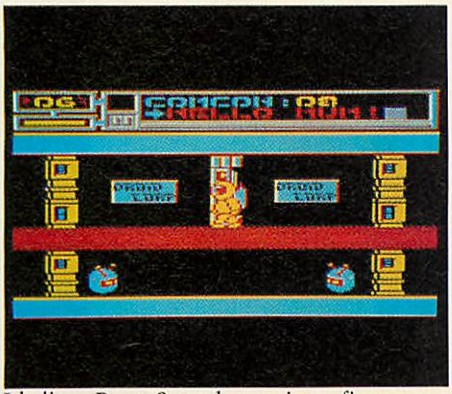
Graphics: ★★
Addictiveness: ★★★
Value for money: ★★★

Not long after the *Repton* trilogy, Superior released Martin Edmondson and Nicholas Chamberlain's *Ravenskull*, a game in the same vein, but with more emphasis on adventure. It is set in a castle, with a four-way scrolling view. Each of the four levels of the castle contains a piece of a crucifix which you must collect using the

many objects at your disposal. These include numerous spells and potions. My favourite part is when you drink a speed potion and you can see how fast the game can really go!

6. *Thunderstruck I* (Audiogenic)

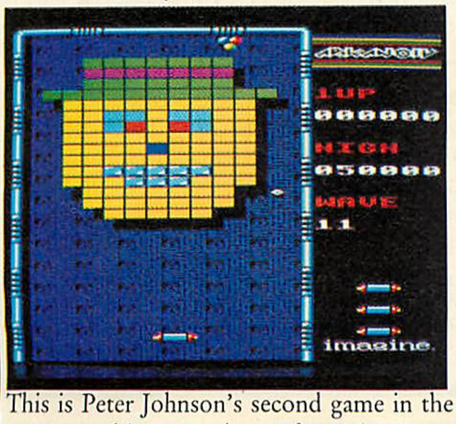
Graphics: ★★★
Addictiveness: ★★
Value for money: ★★★



I believe Peter Scott has written five games this year, of which four are surprisingly similar! I've chosen *Thunderstruck I*, as it was the first of his best. You must explore the graphically depicted castle and try to escape. The sprites are large and detailed with many clever uses of colour to show shading. The movement is also surprisingly smooth for such large sprites. Another reason why I chose *Thunderstruck I*, rather than his more recent games, is that the puzzles in it are at least slightly obvious – how are you meant to know that you use some duty free to open a door!

7. *Arkanoid* (Imagine)

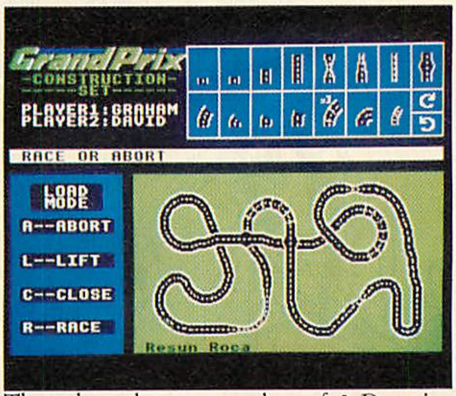
Graphics: ★★★★
Addictiveness: ★★★
Value for money: ★★★



This is Peter Johnson's second game in the top 10, and is currently my favourite game. The recipe for good games at the moment seems to be to take an old favourite – *Breakout* in this case – add some special new features, a silly story and a totally irrelevant name and sell it! I like it even better after ZZKJ's hints published in November. *Arkanoid* is certainly addictive, and I often play it.

8. *Grand Prix Construction Set* (Superior Software)

Graphics: ★★★
Addictiveness: ★★
Addictiveness: ★★

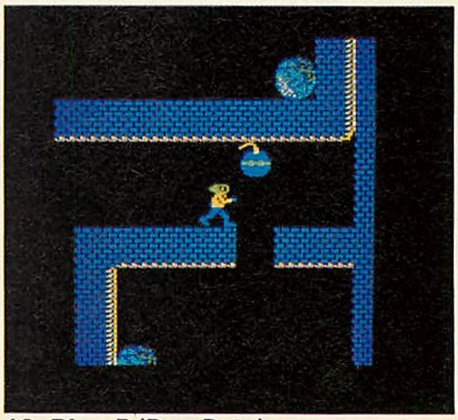


There have been a number of 3-D racing games written for the BBC micro, ranging from *Overdrive* to *Revs*. *Revs* is undoubtedly the best simulation, but is it the best game? This is the niche that I think *Grand Prix* fills. I like antagonistic two-player games: *Grand Prix* lets you design your own race tracks and then race round them, either against the computer or your friends. But you don't have to worry about keeping your revs up or being in the wrong gear, so I think *Grand Prix* has more of an arcade feel to it than *Revs*.

9. *Repton 3/Around the World in 40 screens* (Superior Software)

Graphics: ★★★
Addictiveness: ★★
Value for money: ★★★★

Repton almost got a special prize for being the first game to become a grandparent! *Repton 3* is certainly the most versatile of the three as more levels can be (and have been) released as add-ons: *Around the World* and *Life of Repton*. *Repton 1* set a good standard; *Repton 2* tried, but was, I think, too slow. *Repton 3* has managed to capture the best elements from the first two. The *Around the World* add-on screens show that the game could be almost completely altered simply by changing the sprites. The only other thing I can say is watch out for *The Life of Repton*.



10. *Plan B* (Bug Byte)

Graphics: ★
Addictiveness: ★★
Value for money: ★★★★

Plan B is one game that many gamers may have missed. It came out at roughly the same time as a large number of other cheap re-releases, but it's actually a new game. The idea is to escape from the complex of rooms and passages by finding various shaped keys to open doors and at the same time shooting all the computer equipment you can find! What I found particularly good was the number of subtle puzzles – duplicated rooms and hidden panels and passages for example. The game is certainly very good value for money.

That completes my top 10. But to conclude I would like to mention five other games that I think are noteworthy. Master *Stryker's Run* was the first game to use the Master's extra memory to any great effect. In fact, the game is worth mentioning as having the best background graphics in a BBC micro game!

Next, Martin Bryant has been writing chess programs for many years now, and his *White Knight* series has reached version 12. *Collosus 4* is his latest, and it's definitely the best chess on the BBC micro. There is also an even better Master version with a 3-D display. *Crazee Rider* gets a special mention because of the music. Not only is it excellent to hear music at all in a game, but also some very clever effects have been used. *Crazee Rider* also makes a good Electron game. Of course, I have to include *Zarch*, the best game on the Archimedes. And finally, the golden turkey award for 1987 must go to *Green Beret*, one of the worst games ever on the Beeb.



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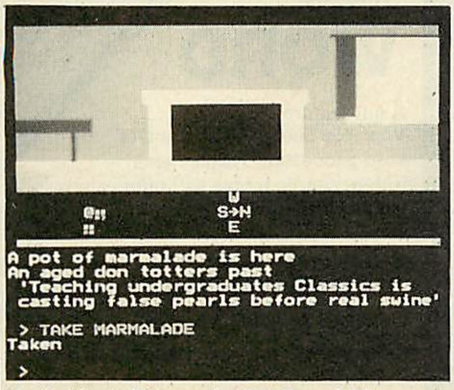
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REVIEWS

GAMES

WELL EDUCATED ADVENTURE



'Oxbridge'; Tynesoft; BBC and Electron; £7.95 (cassette)

Oxbridge is the latest offering from the very successful Tynesoft software house. It's different from most of their recent titles, being a fully illustrated adventure. The BBC micro and Electron are both catered for on the two sides of the same tape, the BBC version having some 300 illustrated locations, and the Electron 200.

The adventure is set in the fictitious university town of Oxbridge on the college campus, which appears to be populated by talkative students and lecturers.

Input is fairly basic. The program accepts up to four words, though the first word must be a verb. Directions can be typed or indicated with the cursor keys, and the addition of an on-screen rosette showing obvious exits is a nice touch. The graphics, while not outstanding, are quite acceptable, and along with the sound effects add considerably to the atmosphere of playing the game.

The problems vary greatly in their difficulty, and the hints printed on the reverse of the cassette inlay helped to reduce the urge to pull out what little hair I have left. I found it easy to wander around at the start without getting killed, which was a nice change from some of the adventures I have tried recently, which tend to be too hard, discouraging beginners.

This is a welcome addition to my adventure library, while not in the same league as Robico or Level 9 it has certainly kept me busy and amused for a while. I would recommend it to any adventurer, and in particular to less experienced players.

Joe D'Arcy

ON YER BIKE!

'Despatch Rider'; Audiogenic; BBC B/ Master/Electron; £8.95 (cassette), £10.95 (40-track disc)

It is Dick Decker's first day working as a despatch rider, collecting mail from letter boxes. He must keep the job if he is to marry his fiancée, the lovely Debbie. Poor Dick, however, encounters many obstacles during the course of his work.

These obstacles take many forms, not all of them recognisable. They include walls, traffic cones and water. Strangely, contact with any of these means instant death. Dick must also take care not to forget to pick up the mail, which is located in seven mail boxes.

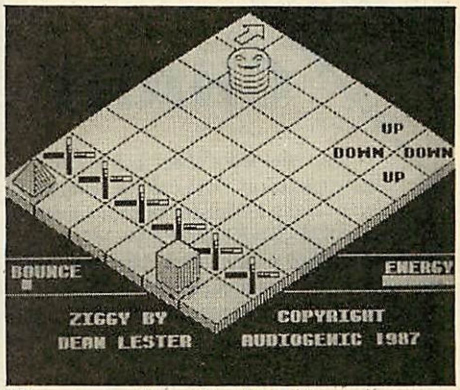
The boxes split the game into seven parts, each part being completed when Dick reaches a mail box. If Dick dies at any stage he is returned to the last mail box he visited. Another problem our hero faces is that his trusty steed, a Yamasaki 750, has a leaky fuel tank. He can get extra petrol by riding over fuel squares. If Dick manages to collect the mail from the mailboxes without losing all of his seven lives, he then has the second post to deal with.

My first impression of this game when I loaded it was not very favourable. Its title pages are dreary, unimaginative and almost illegible. Once into the game itself there was little to change my initial opinion. I found the hideously-coloured graphics unspectacular and the use of sound half-hearted. Dick did not respond well to my keyboard promptings – the keyboard is unresponsive with no auto-repeat. Constantly returning to the beginning of the stage whenever you die (which happened very frequently when I first started playing), quickly became tiresome.

That said, I did quite enjoy playing the game. It's a simple idea, adequately done. The graphics aren't much, but they do scroll very nicely. *Despatch Rider* won't be a best seller and it's not a game that will keep you amused for hours on end, as the sleeve notes claim. It is, however, one of those games which you may well find yourself playing for the odd half hour in a few months' time. All in all: passable, but could do better.

Michael Horend

BOUNCING BACK



'Ziggy'; Audiogenic; BBC Master; £10.95 (disc); £8.95 (cassette)

Ziggy is an unusual character. He appears to be made up of a face stuck on the top of a spring. His object is to collect pyramids which are scattered on levels within a three-dimensional structure. A quarter of the current level is displayed on the screen at any one time.

Each section is made up of a grid of squares. One square contains a pyramid which must be collected. Other squares contain objects such as skulls, balls, light bulbs, patches of glue and wands. Transporter points are also present which move Ziggy up or down one level of the structure, the former only being possible when all four pyramids have been collected.

Objects on the floor are negotiated by varying the length of Ziggy's jump. This is not much help, however, when it comes to avoiding the balls and cubes which fly around above the floor, doing their best to crush him. His only hope against this foe is the stealth, timing and luck.

Help comes in the form of light bulbs, which restore his energy, and wands which protect Ziggy from the flying nasties.

On the graphics front I was impressed. A mode 4 playing screen is used, resulting in monochrome graphics. Lack of colour is compensated by shading, to give perspective to the facets of the pyramids, for example. Some of the graphics have an almost hand-sketched appearance.

Key response could have been a bit better. This also goes for the sound. The user-definable keys are a nice touch. Overall I enjoyed playing *Ziggy*.

Gavin Gillings

SOFTWARE

KITTING OUT THE ARC

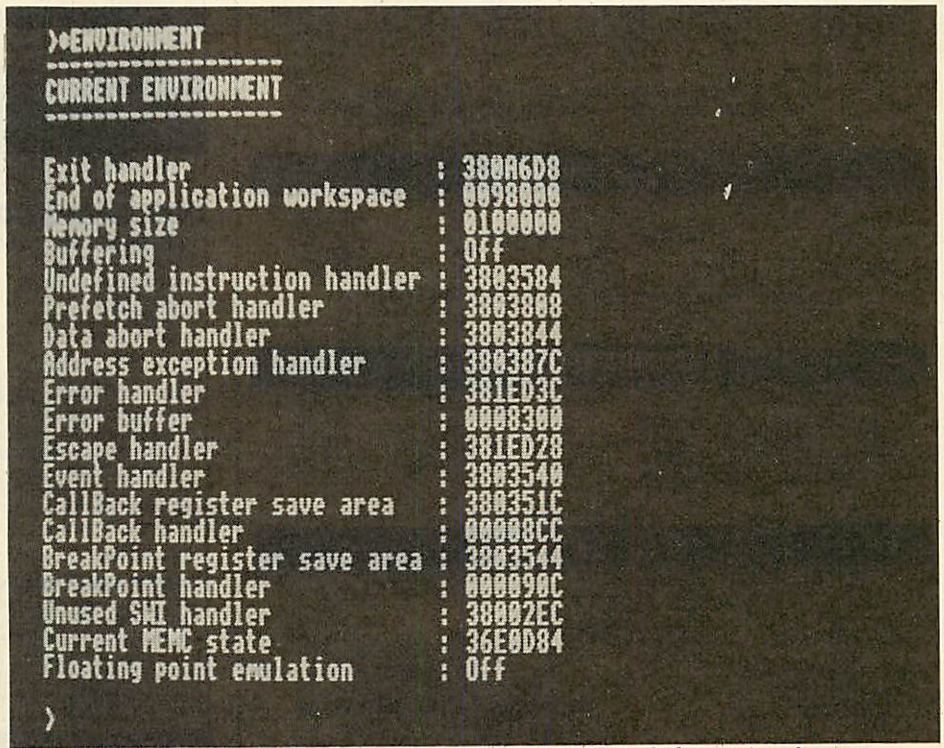
Sam Greenhill gets to grips with the first toolkit specially designed for the Archimedes

The *Archimedes Toolkit Module* is one of the first pieces of software to be released for the new Acorn machine. It is supplied on disc, which is needed only at the start of a session to load the module into RAM. Modules are similar in many ways to ROMs, but have the advantage that they are easy to install.

The toolkit is aimed at experienced users, and its main use is to examine and modify either a disc or the memory. The application performs the same functions in both cases, and can execute its tasks in a number of ways. By typing *MEMORY, you can see the contents of the memory on the screen. The address is shown on the left, and to the right its content. You can then scroll up or down with the arrow keys. If Shift is pressed with the arrow keys, the display whizzes past at an astonishing speed – a vivid demonstration of the Arc's processing power.

Searches can take five different forms: hex, binary, text, mnemonics, or 'words'. You can toggle between these five while in the memory editor, or access them independently by typing *TFIND for text and *WFIND for word, and so on. The hex mode shows the 16 bytes at an address, plus their contents in text, laid out in the some way as the *DUMP command on the BBC micro. Having selected the desired address location, the text can be viewed simply by going into text mode. The screen now shows 64 bytes, each containing a character. Simply browsing through the operating system is interesting enough. I found amusing little things like messages of thanks to various people involved in the creation of the Archimedes.

The contents of a memory location can also be expressed in word form. In this mode, the computer shows four sets of four bytes which make up each word, and then the text content is shown down the right-hand side, similar to that of hex mode. This is all very well, but what if hex numbers mean nothing to you? Well, then you would go into mnemonic mode, which displays the bytes as dissembled machine code. It transforms the first byte in the word to the p-code, and then the rest of it to the operand. For example, &E59018A4 in word format would produce LDR R1, (R0, 2212) in mnemonic mode. The dissembler will prove extremely useful.



The toolkit's *ENVIRONMENT command, shows facts such as the end of current work space

Extensive use is made of wildcards, which help when you're not sure exactly what you're looking for. After seeing the speed of the search, I was quite astonished to find that it actually takes only about 12 minutes to go right through memory from start to finish.

The disc editor works in exactly the same way as the memory editor. It can perform many of the functions of the BBC micro's *Disc Doctor*, which is useful, but it can't reproduce all of them.

The toolkit's main use is in observing data stored in RAM or on disc, but it can also alter the data by means of one-line assembly. If an alphanumeric key is pressed when in the mnemonic editor, you immediately enter the one-line ARM assembler, which allows you to edit code directly using the standard mnemonics but without leaving the toolkit environment. This ingredient of the package can save a lot of time when debugging ARM code. You can use this option to encode without having to re-assemble your source code.

These are the main features of the module, but there are other small extras which help to flesh out the package including *CATALL and *EXALL for lists of all files on a disc, and also the ability to *CONFIGURE certain elements of the toolkit. Don't confuse this with the Archimedes' CONFIGURE command.

One other component of the system is the ability to find important addresses. *ENVIRONMENT gives you the current addresses of 19 useful vectors.

The *Archimedes Toolkit Module* should save hours of struggling with raw machine code. It has been released at a very early stage which will help software developers, but it does make me wonder if a delay could have resulted in a slightly more extensive product. All the same, it is handy, well written, and worth the money.

Archimedes Toolkit Module, *Clares Micro Supplies, £39.95 including VAT.*

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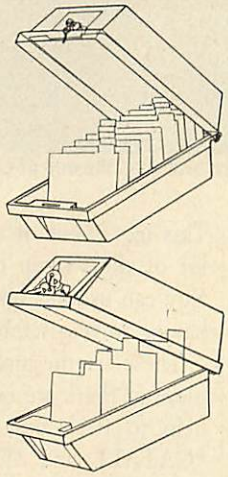
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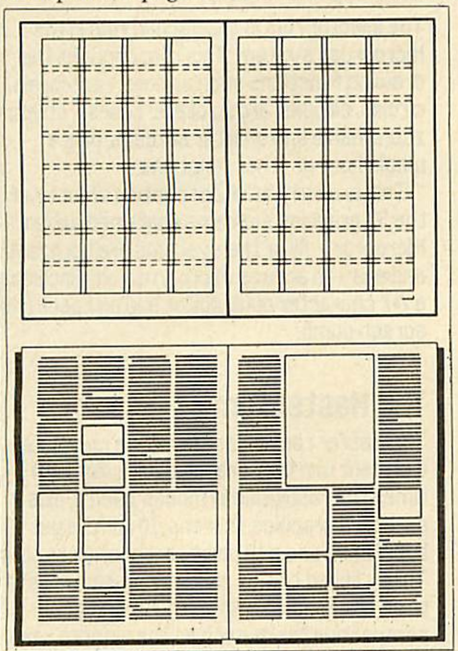
THE LAWS OF THE LAYOUT

Bad design mars much of the output from desktop publishing software. Tony Quinn looks at a book that aims to change all that

As a professional journalist rather than a computer buff, it is one of my hobby-horses that DTP has always been more about computers than publishing. Sadly, this is reflected in most books and magazines on the subject. But I was delighted to see and review *Design for Desktop Publishing*. Most classic publishing works are too heavy, too detailed or too expensive to recommend to computer people with an interest in design, but this book by John Miles fills the gap nicely.

John Miles is a designer who has used a computer to write and lay out his book, so thankfully he's someone who practises what he preaches.

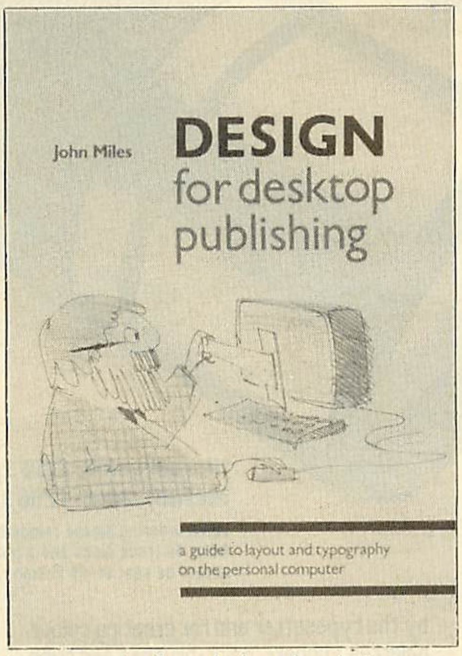
The book was done on a Macintosh (although it doesn't name a single computer or piece of software throughout), and laser-printed pages were used as artwork.



Tips for layout in four columns. A horizontal grid adds discipline without being dull

The book is spiral-bound and A4 in size, making it easy to read and dip into. Important notes are picked out in red; some of these comment on the way the book itself was produced.

Publishers should always remember that the look of a paper strongly influences how



it is perceived, and that the design must convey the editorial content. Layout and typography are the prime ways of influencing the look, and these are applied right through the publishing process, from identifying the market to printing and binding. The author isn't afraid to go into detail on headings, tables and the like. These details can be the bane of newcomers to print, and my advice would be to follow the author's style.

The chapter on page grids will be useful to most people. This deals with working out column sizes for various types of publications, and introduces the horizontal grid to govern the look of a page and impose discipline on layouts. The author does assume some knowledge and feel for aesthetic considerations, and so readers may be perplexed by talk of 'white space', page 'balance' and headline 'weight'. Many people feel they will never gain an appreciation of these things, but they can be covered by adopting a set of guidelines and keeping things simple. As the introduction says: 'It is a matter of judicious selection based on experience, so good advice for the novice is – if in doubt, leave it out!'

Design considerations are subject to the whims of fashion, but the author is always keen to go back to the fundamentals of good design and typography – helping readers to find their way about.

The weakness of the book is the author's strength – his background in books. The design fundamentals of magazines and newspapers are covered, but the details, such as spacing around headlines, and layout strategies for news pages are not. The few examples shown are not good ones. A four-page chapter is given over to the preliminary pages in books, very much an area for aesthetic typography, while covers, and the treatment of regular sections in magazines, such as letters, are barely touched on. However, don't allow these points to put you off this book if you're planning or publishing a magazine. Get the basics right first, and develop your understanding from there. The details can be filled in by looking at other magazines.

Anyone involved in DTP should buy this book – and so should people in mainstream publishing. Don't think you need a Mac or an Arc either; *Stop Press* and *Fleet St* users will find it just as relevant. Anybody entering our Great Newspaper Competition could find it tips the scales as to whether they win an Arc or not! *Design for Desktop Publishing* is easy to read, talks sense and will be useful in the first 10 minutes after you buy it, as well as 10 years later. The essentials of design are the same whether you're doing a newspaper or a book, and this title covers them all.

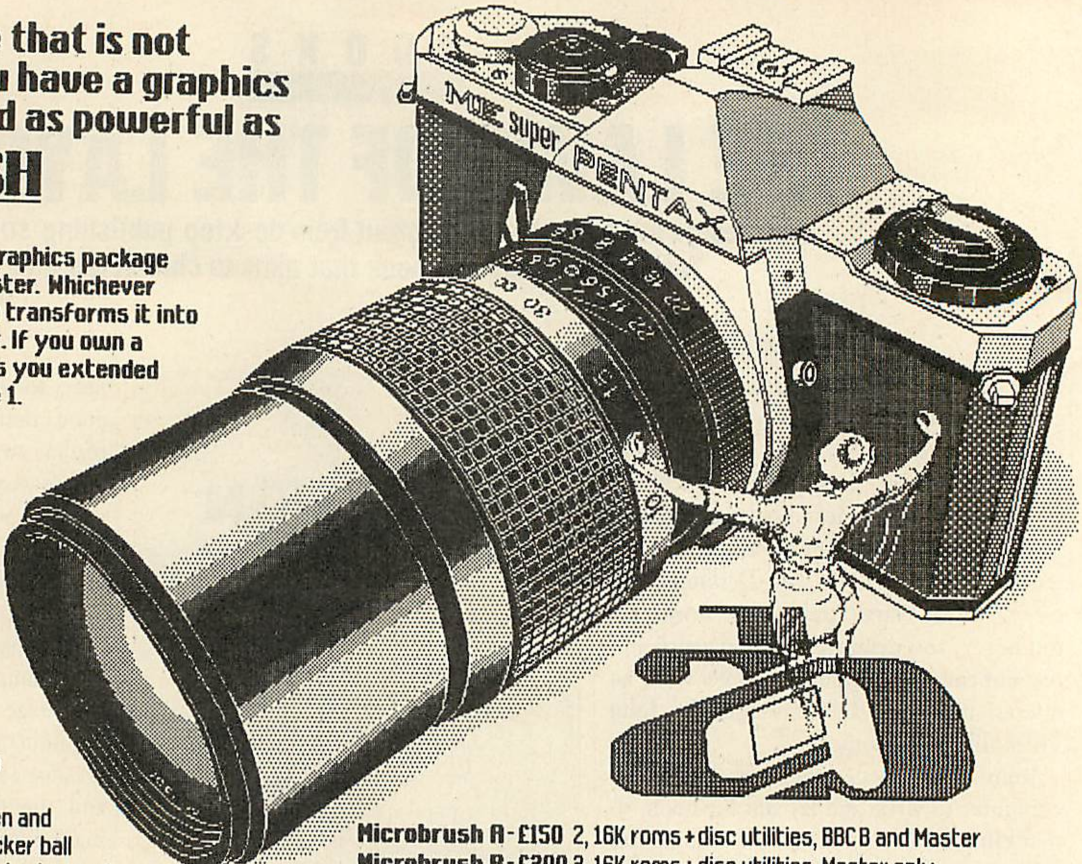
Design for Desktop Publishing *by John Miles, Gordon Fraser, 103pp, £9.95 (paperback) £15 (hardback).*

A monthly magazine, DTP Desktop Publishing, *is available from Dennis Publishing, 14 Rathbone Place, London W1P 1DE. It's very hardware based, covering only IBM PCs and the Apple Mac. Another title,* Wordsmith, *comes out six times a year. This looks and feels very much like a hobby magazine, aiming more at authors and small publishers. Details from:* The Wordsmith, *Mandarin Publishing, The Old House, Church Road, kennington, Ashford, Kent TN24 9DQ.*

Could you produce this advertisement on your Micro?

There is very little that is not possible when you have a graphics system as fast and as powerful as

MICROBRUSH



Microbrush is a professional graphics package for either the BBC B or the Master. Whichever machine you have, Microbrush transforms it into a powerful graphics computer. If you own a Master then Microbrush offers you extended resolution in mode 0 and mode 1.

Mode 0 - 1216*416
Mode 1 - 608*416

This whole A4 page was composed as one mode 0 high resolution image using the out-board scroll system, and has a resolution of 1216 * 900 pixels.

Microbrush for the BBC B is comprised of two 16K roms. The Master version contains a third rom. The first two roms can be used in either machine.

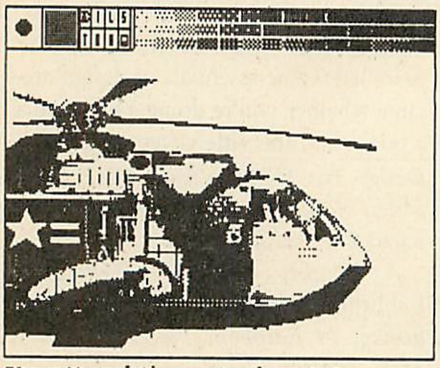
The whole system is menu driven and controlled by the Marconi RB2 tracker ball for speed and precision, but may also be used with either the AMX or the Whigmore mouse. Please note that the tracker ball is not included.

Microbrush A-£150 2, 16K roms + disc utilities, BBC B and Master
Microbrush B-£200 3, 16K roms + disc utilities, Master only.

When ordering please remember to state which system you require, whether you need 40 or 80 track discs and a telephone no. if you have one. Orders and information requests should be sent to-AB Designs, 81 Sutton Common Road, Sutton, Surrey. Phone 01 644 6643

The Colour System

This is just 1 of 33 major graphic systems contained within Microbrush and offers you 42 colours in mode 1 and 42 grey tones in mode 0. New colour palettes can be created with which you can draw lines, sketch, fill, paint in foreground, background, opaque, transparent and combined colour. Add this to a colour rubber which will selectively erase any actual colour and you have a very powerful painting system with more than 1,000,000 possible colours.



Above the painting system in mode 0.

The Ikon Generator

The ikon generator is the main workhorse of the Microbrush system as it is used for both generating and positioning any ikon up to 6*3 character blocks. This system is also used by the typesetter and for creating colour palettes, rubbers, paint-brushes and typefaces. Up to 46 ikons can be stored in memory. The scope of the ikon facility is immense as it allows you to transform the Microbrush system into a purpose built design tool that suits your needs.

The Type Setter

With the Microbrush system you will receive 50 proportionally spaced typefaces. The smallest allows you up to 170 characters to the line and if this is not enough then you can design your own typefaces.

The typesetter displays the current font as a scrollable menu allowing you to quickly produce professional typography.

The Screen Editor and the Special Effects Generator

The screen editor is a powerful drag system that allows you to store up to a quarter of the screen in memory. Once stored, images can literally be dragged across the screen, repeated, copied, saved to disc or fed to the special effects generator.

The Special Effects Generator

This is a very versatile system which will automatically outline, inline, shadow, 3D, half-tone, etc. any image held within the screen editor's memory.

The Injector rom

The Injector rom is the second rom in the Microbrush system. This rom contains the drawing functions such as lines, rectangles, circles, ellipses, arcs, rotate, squash, stretch, zoom, halve and quarter screens, plus a whole host of other functions.

This is a very brief description of just 7 of the 33 graphics systems contained within Microbrush. All of the systems are both fast and easy to access. Microbrush also includes a 7*7 character pixel editor and an Epson FX80 screen dump.

The Master rom

The Master rom takes you into a completely different world of graphics with almost 4 times the resolution in modes 1 and 0, plus 2 on-board graphics screens, 10 rom based typefaces and a 10 point perspective system. This is linked to a 3D generator which is soon to be released on a 4th rom for complex perspective tasks such as the camera seen above. Also available for the Master rom is an out-board scroll system which allows you to build images with a resolution greater than 1216*2000, plus there are high res. screen dumps for both Epson and Integrex printers.

Lastly flick through the pages of this magazine and see how many of the other graphic systems are capable of producing their own advertising.

Extentions to the Microbrush system include - The out-board scroll system-£40, an extended Master rom offering you 14 colours in mode 1 and 4 colours in mode 0-£85, a typeface editor plus fifteen extra typefaces-£25, the Master rom when purchased separately-£65.

REVIEWS

BOOKS

A GOOD START FOR COMPUTER STUDIES

'Introduction to Programming' by Jeff Naylor; Paradigm; £8.95

The heart sinks when another 'introduction' book arrives in the office. Most of them are cashing in on the home computer market, and are dull and poorly written.

This one, however, is different. It is a professional piece of work, with a clear understanding of the important topics – control structures, data structures, program design, documentation and so on. It doesn't even use Basic.

The book is intended as a primer for people taking up computer studies. As usual, the text assumes no previous knowledge of computers, which means that the early sections spend a lot of time going through basics of the 'this is a disc and this is what it does' variety. This information is important for the book's particular market, but fairly tedious for anyone who is already messing about with computers.

The intended market is obvious from an emphasis on data processing and the choice of languages for the demonstration programs – Cobol and Pascal.

If you are totally new to programming, this book is probably the wrong choice – at least for BBC micro owners. It is, however, an excellent introduction for computing students, and will also prove useful if you want to make the move into serious programming in Cobol or Pascal.

It could also change the way you look at programming. If you've had no training in writing programs, and have just picked up knowledge from books aimed at the home market, you may find this book useful.

Steve Mansfield

ALL THE INS AND OUTS

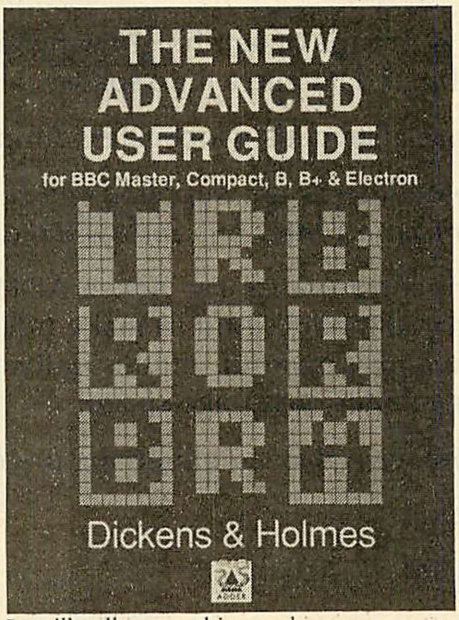
'The New Advanced User Guide' by Adrian Dickens and Mark Holmes; Adder; £19.95

The original *Advanced User Guide* found its way on to the bookshelf of almost every BBC micro programmer in the country. It filled all the gaps left by Acorn's documentation, and it brought together in one place all the technical information programmers need to get every ounce of performance out of the machine.

The problem with the old version, however, was that Acorn insisted on bringing out new micros. While nearly all of the information in the guide was still relevant to the machines, there was so much extra that needed to be covered.

This new version puts that right. It covers all the BBC micros, from the B to the Compact, plus the Electron.

If you're programming quite happily in Basic and still don't know what an Osbyte is, then you're unlikely to need this book.



It will sell to machine code programmers and those people wanting to utilise the special features of the machines – there are sections, for example, on controlling shadow RAM, programming video circuitry and utilising paged ROMs. There are complete reference sections for the assembler, the 65CO2 chip and Osbyte calls.

The book is, of course, intended as a reference work, and as such is very comprehensive, though for the newcomer to the computer's inner workings it can be confusing. You need a good grasp of the jargon and a fair understanding of how the machine works before you can use, or even understand, much of this information.

As a wirehead's bible, full of arcane and detailed information, the new guide is excellent, if somewhat expensive. However, if you want to learn about how the machine works, look elsewhere.

Steve Mansfield

THE BASIC POINTS

'The Handy BBC Basic Guide' by Alan Marshfield; Blackie & Son; £6.25

Five years on, and there is still no definitive guide to learning BBC Basic. Many authors have tried, but no one has written a book that stands above the rest.

This book is aimed directly at those studying BBC Basic within the context of a GCSE or vocational course in computer studies. It shows in the arrangement of each chapter; a section of text giving information on a particular topic, followed by a group of self-test questions, then finally a 'cheat-sheet' of hints to be used only if help is needed on the questions.

The structure is educationally sound and works well. However, the inclusion of a snippet on graphics and sound in every chapter leads to a disjointed approach. A quirky feature, such as redefining characters with VDU 23, is described before fundamentals like FOR . . . NEXT loops.

The introduction, containing advice for beginners, should serve to minimise the difficulties experienced as people sit at a keyboard for the very first time. Unfortunately it doesn't.

The description of formatting assumes that a 40-track disc drive is being used. The scrolling of text off the top of the screen is supposedly demonstrated by listing a five-line program which can easily be shown in one screenful. A description of the NEW command is completely ruined by the omission of the word 'don't'. Furthermore, "*" is given as an abbreviation for *CAT! Tiny errors and omissions abound throughout the book, and a beginner is bound to be confused or put off altogether.

The book also makes no mention of the different versions of BBC Basic that are available. The use of the OPENUP command means that some of the listings in the book are for Basic 2 only. At no point is Basic 1 mentioned, and yet many school micros are still fitted with this ROM.

I liked the idea of this book: an educationally sound introduction that starts from how to switch on the computer. The reality is less likeable: a very readable book marred by poor preparation.

Graham Bell

HARDWARE

CHIPS WITH EVERYTHING

Chris Drage wades through the sea of Master add-on cartridges and ROM expansion boards

With the Master 128, Acorn designed a computer with far more sideways ROM/RAM options than its predecessors, including two specially designed cartridge slots, which can accommodate many different peripherals such as EPROM programmers, genlock video interfacing systems, RAM cartridges and ROM cartridges. Each cartidge slot is capable of supporting two 8k,



Slogger,ACP and Acorn cartridges (r to l)

16k, 32k, 64k or even 128k chips. Many companies are marketing cartridges and two, Vine Micros and HCR Electronic Services, each provide variations in utilising the ROM potential of the Master 128.

Standard cartridge systems are offered by Acorn, Advanced Computer Products (ACP), Peartree and Slogger. The Slogger cartridge and the Peartree MR5000 offer perhaps the most simple units at a budget price. Each accepts two 8k or 16k chips which are inserted into their respective sockets through holes in the back. As a result, these cartridges leave the ROMs rather exposed. Another disadvantage is the tight fit within the apertures. It takes a good deal of skill to extract a ROM once it is inserted – best to leave it there!

The same is true for the Acorn cartridge, the only difference being that the circuitry on the board allows 32k and 64k chips to be used, though no software is provided to access each 16k page. The Care Electronics Master cartridge sensibly provides large apertures which makes ROM extraction easier. In addition, this cartridge is taller than the others and by positioning ROMs horizontally above the top surface of the computer it allows tall 'carrier board' ROMs like *InterWord* to be used easily.

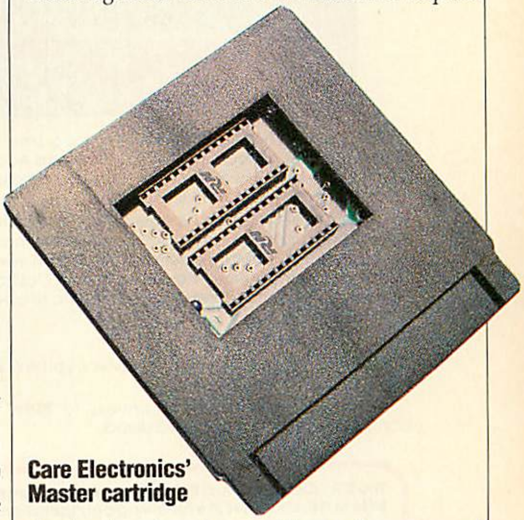
My favourite is the ARA2 cartridge from ACP. This unit encloses the ROMs completely, making it an ideal choice for educational establishments where valuable chips are secure from prying fingers. Like the Acorn cartidge, this unit can accommodate 64k chips and will even handle 128k paged devices, it is claimed. When used in conjunction with the *Advanced Control Panel*, each of the four pages of stacked ROM images in a 64k EPROM can be selected. Very slick indeed.

Providing you have access to an EPROM programmer like HCR Electronic Services' Micron Plus or Technomatic's Epromryter, you can stack all your most frequently used ROMs in two EPROMs and have eight chip-based programs available all the time. With 128k EPROMs up to 16 ROM images can be held in the ARA2 – you would never need to take out the ARA2 once inserted! One word of advice: remember to check with the ROM manufacturers to ascertain whether making an image of it is permissible, otherwise you would be infringing copyright.

There are two cartridge systems which allow four ROMs to be installed. The Care Quad Cartridge and the Peartree MR6000 take only 8k or 16k chips, and only two ROMs can be 'on line' at one time – switches on the top of each cartridge select the pair of ROMs you require. Being taller, the Care cartridge provides adequate access to the socketed ROMs to enable easy extraction. The Peartree cartridge allows very little aperture space at all. However, this cartridge is more versatile and enables the sockets to be populated by four static RAM chips, providing two 16k banks of sideways RAM. A disc of RAM utilities is available from Peartree with the MR7200 (sideways RAM version) cartridge. The switches double as RAM select and write protect controls.

It may be that you would like to swap your ROMs between a BBC B or B+ micros and a Master 128. This is possible with either the Viglen Master Cartridge System or Care Master ROM Extender. Essentially these comprise an adapter to allow each company's BBC B cartridges to be used with the Master 128. The Viglen system uses an adapter which takes two of the company's special cartridges. Both systems can accept 8k, 16k and 32k devices. The adapter however, is quite different from the BBC micro one, and to swap cartridges between different models of BBC micros you must use the appropriate devices. The Care system uses an adapter which accepts one ROM at a time. It's squat and unobtrusive compared with the Viglen's, but like the Viglen cartridge, each unit encloses the ROM, protecting it. Each is ideal for use in environments where portability between different machines and security of ROMs is paramount.

With the exception of Care Electronics' Master and Quad cartridges none of the afore mentioned cartridge systems can accept ROMs like *InterWord*, which are mounted on small carrier boards. These 32k or 64k devices fool the machine into thinking they are single 16k ROMs, so the only constraint is whether they physically fit into a cartridge slot. The Viglen Master Cartridge and Care ROM Extender require



Care Electronics' Master cartridge

the backs of each cartridge to be removed to enable installation of these ROMs. They are vulnerable, but function quite happily, like this.

An alternative to the conventional cartridge concept is offered by HCR Electro-

The 5¼" disc version of Elite now includes:
- The standard Model B, B+ game
- The 6502 Second Processor version
- The Master 128 or Turbo version



BBC Micro Models B, B+

BBC Master Series

Elite, the widely acclaimed 3-D space game, is the highest-selling game ever published for the BBC Micro and Acorn Electron. It is now available in enhanced versions specially produced for the 6502 Second Processor and the Master 128 Series.

In **Elite**, all players start as equals. With the initial rank of "Harmless," you will embark upon an experience unlike any that you have known before. You will be a space trader who roams the universe, making your living from buying and selling the cargo in your Cobra space craft. On your travels, you will encounter aggressors who are eager to put an end to your dealings.

Only the fittest will survive.

As you establish yourself as a survivor, you will win the right to a higher rank.

In all, there are nine, from "Harmless" to "**Elite**." And your computer will continually tell you where you stand.

Trade with 2,000 planets in eight galaxies

Besides survival, your success also depends on the rewards you reap from the cargo that you carry.

That cargo can be anything from foodstuffs to contraband. If you decide to trade in contraband, the rewards will certainly be higher. But so will the risks you take.

To ply your trade, you can dock at any of the 2,000 planets in eight galaxies.

However, before you dock, you must use your wits to assess the planet's political climate and the perils which may be waiting for you.

Also, in any of the eight galaxies, you may find yourself being asked to perform acts of considerable heroism and selfless courage.

Although these will bring you into danger, they can bring considerable rewards too.

Are you ready to accept the challenge?

The 5¼" disc version of Elite features a dual format design which allows Elite to be run under the following configurations:
- BBC Micro Models B and B+ with either a 40 track or 80 track disc drive.
- BBC Micro Models B and B+ with 6502 Second Processor and 80 track disc drive.
- BBC Micro Master 128 or Turbo with 80 track disc drive.

Acorn Electron Cassette	**£12.95**
BBC Micro (Models B, B+) Cassette	**£12.95**
BBC Micro 5¼" Disc	**£14.95**
BBC Master Compact 3½" Disc	**£19.95**

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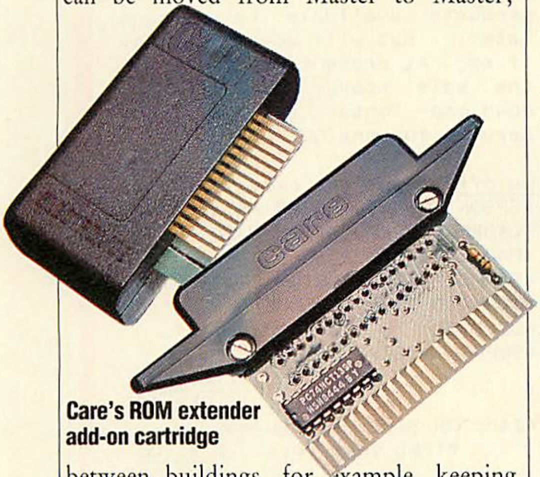
nic Services' Rombox. This external box expands the cartridge sockets to allow easy selection of up to three banks of four ROMs (up to six banks if a second card is installed). In addition one bank can be made to hold 16k of battery backed RAM.

The Rombox accepts 8k, 16k and 64k devices. As 64k chips can be used to hold up to four 16k ROM images then the total number of ROM images present on each card can be as high as 48!

The Rombox has its own power supply unit and is connected to the cartridge sockets by ribbon cable and an adapter card with two small PCBs securely joined. Unfortunately both cartridge sockets are used, leaving you with none for other devices you might want to install.

The second card is very easy to install. HCR provides all the extra plugs, power leads, mounting pillars and a toggle switch to enable each board to be accessed. The software contains a number of useful routines for moving ROM images about and paging the 64k chips. If two images on the same chip are required, the software will move one out to sideways RAM, allowing access to both.

The Rombox enjoys the convenience of avoiding wear of the cartridge connectors as there is no need to constantly plug and unplug cartridges. Valuable ROM software can be moved from Master to Master;



Care's ROM extender add-on cartridge

between buildings, for example, keeping the library of ROM software together in one easily portable, yet very robust unit. And there is the bonus of added security, as the Rombox is not as easy to misplace as cartridges are.

Vine Micros has adopted an entirely different approach. The Romboard 3 is designed to overlay ROM images in the Master's one megabit ROM. Briefly, this means that by selecting a link on the Romboard 3, a ROM on board can be selected instead of say, *Edit* or *Terminal* in the 1Mbit ROM. The board offers three ROM sockets. Thus, if you would prefer to have members of Computer Concepts' *Inter* family resident, three of these can overlay *View*, *ViewSheet* and one other ROM image.

Naturally, care must be taken in deciding which images to overlay. Once the link is made and the computer's lid is replaced it is rather awkward to reselect the overlayed ROM image. Vine Micros sensibly provides link switches (as an optional extra) to facilitate selection of the ROMs. These can be mounted at the rear of the Master's cabinet.

Rombard 4 takes this concept a stage further by providing two pairs of ROM sockets to overlay either the four sideways RAM banks or the four cartridge ROMs. Read/write protection of the sideways RAM is also provided by this board. The links provided enable combinations of ROM and RAM to be overlayed, thus a suitable combination of software and computer power can be achieved. Again, link switches can be purchased to selectively enable or disable ROMs overlaying RAM or cartridges.

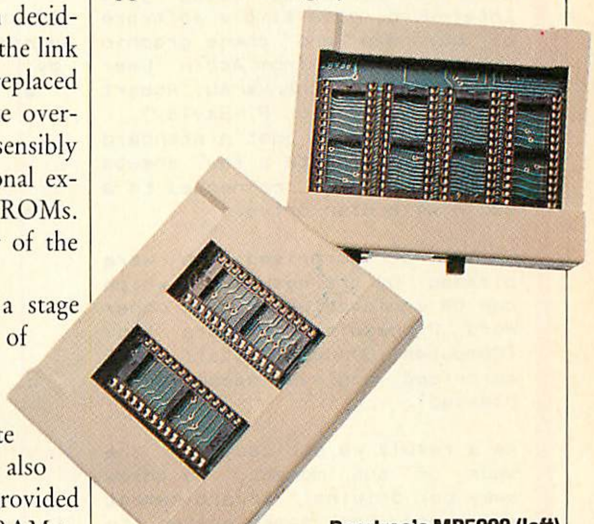
Romboard 3 and Romboard 4 are made to high standards and are straightforward to install. They co-habit happily together in the computer – the only problem being where to secure the switches. Combined with *Master Replay* (a version of which can reside on Romboard 3), the complete system provides a powerful ROM upgrade for the Master 128.

Which one?

Which of these methods is best for utilising the ever expanding range of ROM-based software for the Master? Each has its merits and shortfalls. The table on page 161 shows the various boards rated in terms of design, construction, ease of chip insertion and removal versatility, documentation and value for money.

For a straightforward system, the Care Master Cartridge and the Peartree MR5000, can't be beaten for price. However, ARA2 and the Care Quad cartridges are probably best all round, offering more choice. The Peartree MR7200 is well worth considering for expanding the machine's sideways RAM potential. For ROM portability between different BBC models, the Viglen Cartridge System has an edge over the Care ROM Extender.

For those who prefer to have all their ROMs in one self-contained, secure unit, the HCR Rombox is flexible in its approach and is highly recommended. For



Peartree's MR5000 (left) and MR6000 (right)

those who feel the need to overlay the software provided on the Master, the Vine Micros Romboard 3 certainly permits this and coupled with the Romboard 4 extends the Master's flexibility considerably.

One thing's for certain, there is now sufficient range of ROM expanders and add-on boards to suit the needs of every Master 128 user. Shop around and find the product that suits you.

The Viglen ROM adapter is available from Viglen Computer Supplies, Unit 7, Trumpers Way, Hanwell, London W7 2QA.

The Romboard 3 and Romboard 4 are produced by Vine Micros, Marshborough, Sandwich, Kent CT13 0PG.

The Rombox is available from HCR Electronic Services, HCR House, Bakers Lane, Ingatestone, Cambridge.

The Acorn cartridge is available from Vector Services, Unit 21, The Ideal Complex, Victoria Road, Wellingborough, Northants NN8 1HJ.

The Slogger board is available from Slogger Ltd, 107 Richmond Road, Gillingham, Kent ME7 1BR.

The ARA2 may be obtained from Advanced Computer Products, 6 Ava House,

REVIEWS

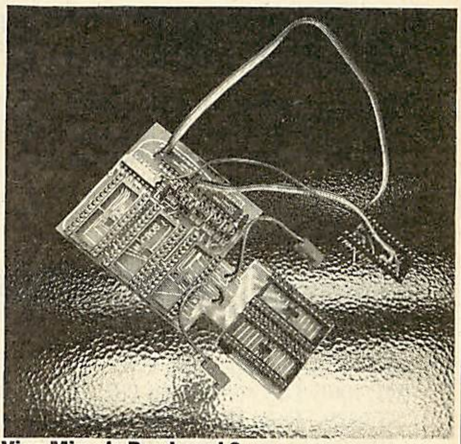
HARDWARE

CARTRIDGES AND EXPANSION BOARDS

System	Acorn Cartridge	ACP ARA 2	Care Cartridge	Care ROM Extender	Care Quad Cartridge	Peartree MR5000	Peatree MR6000	Viglen Cartridge System	Slogger Cartridge
Design	3	5	4	3	4	3	4	4	3
Construction	4	5	4	4	4	4	4	4	4
Ease of chip removal/ insertion	2	3	4	4	4	2	2	4	2
Versatility	3	4	3	4	4	3	4	4	3
Documentation	3	3	2	2	2	1	4	4	1
Target price	£15	£15	£10	£14	£15	£10	£14	£15	£10
Value for money	3	4	5	4	4	4	5	4	3

Key: 5-Excellent, 4-Good, 3-Satisfactory, 2-Poor, 1-Very bad

Expansion board	HCR Elec Rombox	Vine Micros Romboard 3	Vine Micros Romboard 4
Design	5	4	4
Construction	5	5	5
Ease of installation	5	4	3
Ease of chip removal/insertion	3	3	3
Versatility	4	4	4
Documentation	3	3	4
Target price	£78	£23	£36
Value for money	3	4	3



Vine Micro's Romboard 3

High Street, Chobham, Surrey QU24 8LZ.

The Care Master cartridge, Quad cartridge and ROM extender are available from Care Electronics, 800 St Albans Road, Garston, Watford, Herts WD2 4WL.

The MR5000 and MR6000 can be obtained from Peartree Computers Ltd, St Georges House, Huntingdon, Cambridgeshire PE18 6BD.

REVIEWS

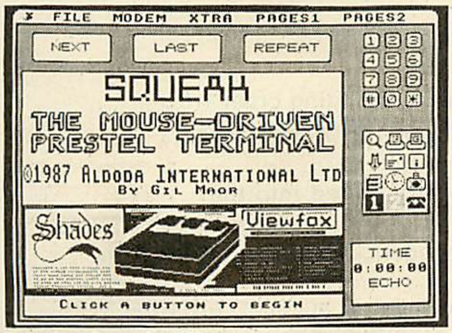
SOFTWARE

MOUSE IN THE HOUSE

Squeak; Aldoda International; ROM and disc £24.50, disc £22 (inc VAT)

You've probably guessed from the name that this package has something to do with mice! What's not so obvious is that it's communications software. In fact, *Squeak* is a mouse-driven viewdata terminal program, which is really quite ironic.

Viewdata systems in general, and Prestel in particular, were originally designed to be easy to use. All you needed was a numeric keypad to type in the page numbers. However, with the advent of response frames and electronic mail, most users now have full alphanumeric keyboards, and the vast majority of them are using micros.



Entering *Squeak*'s title page

A keyboard can be quite intimidating to those not used to it, which is why mice first came into the world. So, on the face of it, using a mouse to control communications software is a good idea.

On computers where the mouse and its attendant software are part of the system, like the Apple Macintosh and the Atari ST, there's no real problem, and excellent rodent-orientated comms software exists for both of those machines.

The problem with the BBC micro is that the mouse is an afterthought. Loading the *Squeak* program into my Master was quite a performance, with the disc having to be booted three times – once to load the ROM images, including the AMX Mouse ROM which wasn't supplied on my *Squeak* disc, once to turn the mouse pointer on and finally to run the main menu program. Non-computer users would probably have packed up and gone home by this point.

Having got into the program, the effort becomes worthwhile. You are presented with a graphic menu offering the terminal itself, a carousel display and page selector, print option for the carousel, access to star commands and a configure option. This last one is very useful. You use it to tell the program which machine you've got, whether the ROMs are plugged in or need to be loaded into sideways RAM and for setting the various communications parameters, like baud rate, Prestel identification and so on.

You don't have to use a mouse with *Squeak*. It's quite possible to use the keyboard or even a joystick. Anything but the mouse is slow and awkward.

Moving around Prestel is easy. There's an on-screen numeric pad, large boxes for the next page, last page and to repeat a page if it has been corrupted. And frequently accessed pages can be named and selected through drop-down menus. It's also possible to point to a Prestel menu line on the screen and just hit a button to choose that option – it doesn't always work, but it's a nice, and unusual, feature.

The Prestel page occupies most of the screen, though not in the full range of colours. If you want full teletext colours, just click on an icon and the page suddenly fills the screen. Toggling between the two screens is fast and easy.

These and other features make *Squeak* an enjoyable program to use. If you have a mouse, and Prestel satisfies all your communications needs, then the package is certainly worth considering. For those people who want to access scrolling-terminal services, like Telecom Gold, and who want features like auto-dial modem drivers, they will have to look elsewhere – at something like *Modem Master*.

Steve Mansfield

TED THE BIG ED

TED; Watford Electronics; £35 + VAT

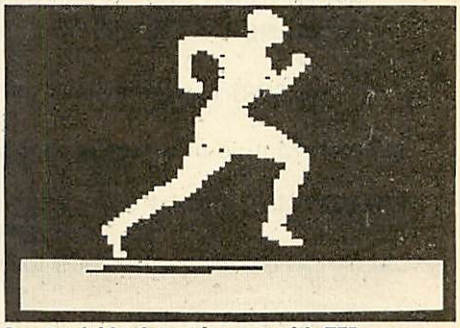
I've never been able to work out why people want teletext editors. There are those who need to create frames for viewdata systems of course, and people who like to create pretty mailboxes for Prestel – but, as far as I'm concerned, that's a very small market. Since playing around with Watford's *TED* package, however, I've started to see some of the attraction, and some of the potential, of creating and stringing together teletext pages.

Mind you, it's a mistake to think of teletext simply in terms of the sort of thing you see on Prestel; *TED* is capable of much more than that. Large scrolling text, flashing colours and even animation are all possible with this software. For example, the demo disc included in the package has a large bird flapping its wings as the background scrolls past.

All right, professional computer graphics it ain't. You're still stuck with teletext block graphics, but at least there are plenty of ways to liven them up.

The software is on what Watford calls a 'PALPROM' – a 32k chip mounted on a carrier board which looks like a normal 16k chip to the machine.

The editor is very powerful and gives (unusually), a full 25-line display. In addition to the usual control over colours, double-height text, and so on, you have access to wordprocessing features such as cut and paste and search and replace.



Create vivid teletext images with *TED*

There's a wide range of large font styles available, and a special line drawing mode for graphics. And a utility is included for converting graphics screens created in other modes for the mode 7 display. These screens could include digitised pictures. Once created, *TED* allows you to link the screens. That means you can have a display of text, graphics and animation which could be used as a shop display, as part of an audio visual presentation, or even just for fun.

Finally, the software is well designed and easy to use; it certainly takes the tears out of teletext.

Steve Mansfield

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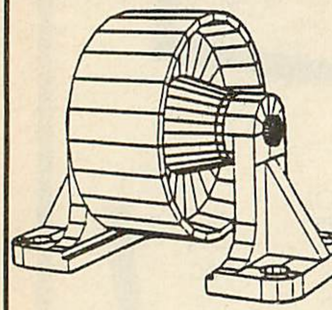
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REALTIME SOLIDS MODELLER

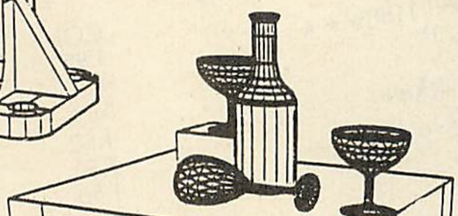
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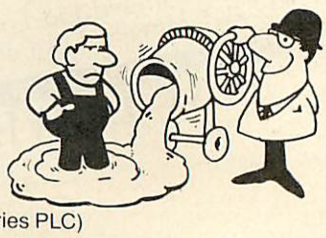
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BRUSH STROKES

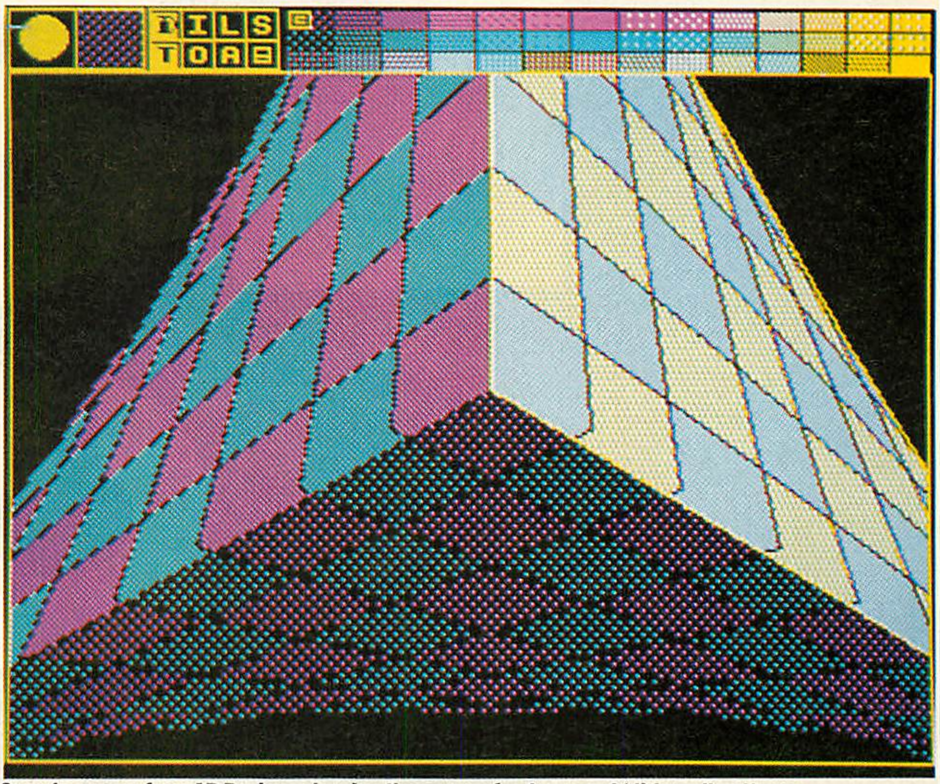
Art packages for the BBC micro are growing in versatility. Tony Quinn gets to grips with *Microbrush*

Regular readers must have seen the news stories and adverts in *Acorn User* for the art package *Microbrush* by AB Designs. The adverts were produced on the software itself. This review is of the two-ROM version which enables you to work in mode 0 or 1. A three-ROM version is needed to do A4 pages like the adverts. The software will work with a mouse, but you're better off with a Marconi Trackerball for precision drawing.

I reviewed *Stop Press* and *Fleet St Editor* in May and June 1986, so when I saw what the two-ROM *Microbrush* system could do I was keen to give it a go. I had sketched out an ambitious comic spread for Thunderbirds in the style of Frank Bellamy. But once I got to the software, the practicalities were just too much, and I ended up starting on Maggie Thatcher!

There is little doubt that you can do more with this system than any other on the BBC B or Master, and to get any better you have to go to a Macintosh or Archimedes. However, I found there was a price to pay, and it wasn't just the £150 for the two-ROM system reviewed. The main problem was ease of use – this software is certainly not simple. *Microbrush* aims to get the best possible results on paper, and even two (or three) ROM chips aren't enough. For many essential facilities, such as pixel editing, printing pictures and typography, you have to use a disc as well. Here I found problems because the system is fiddly and prone to error (and I made plenty of them!). Switching between drives was cumbersome, and sometimes it just wouldn't do what I wanted it to do. You have to be careful not to overwrite files, and to be precise when pointing to icons. If you get it wrong, the results aren't necessarily disastrous (although I did overwrite some files), but they are annoying.

Anyway, let's get back to the Maggie picture, which was done freehand in mode 0. Pictures can be drawn with a mouse, but a Trackerball is better. Very few facilities were used here, and it took a couple of hours to do from scratch. As you can see, I added some text from the typesetting section. This was fairly laborious as you have



Sample screen from AB Designs showing the range of colours and 'dithered' patterns







Margaret Thatcher may not be everyone's favourite subject, but here she is after some freehand sketching. Top left shows standard menu with brush size, chosen shade and shading choices. Top right shows file loading system with a later version of Maggie. Left shows the minimal screen dump (on an Epson-compatible Mannesman Tally), which takes about three minutes

128K ROM

MEGA 3

MEGA-3 ROM

A single 128K ROM containing INTER-WORD, INTER-SHEET and INTER-CHART. The package contains all manuals, keystrips and quick reference cards supplied with the individual packages, but the software is *all* on one chip, occupying just one ROM socket.

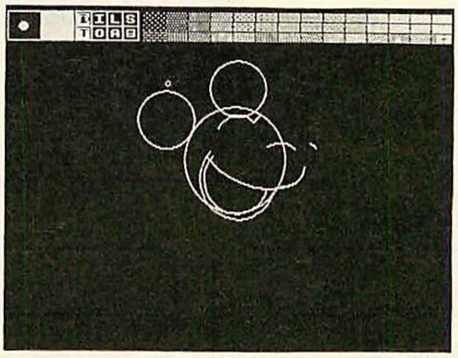
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Upgrades: Existing owners may optionally trade-in their INTER-WORD, INTER-SHEET or INTER-CHART for a discount of 25% each. This means that existing owners of all three may obtain a trade-in discount of 75%—a cost of just £21.25 + VAT (£24.44 incl.).

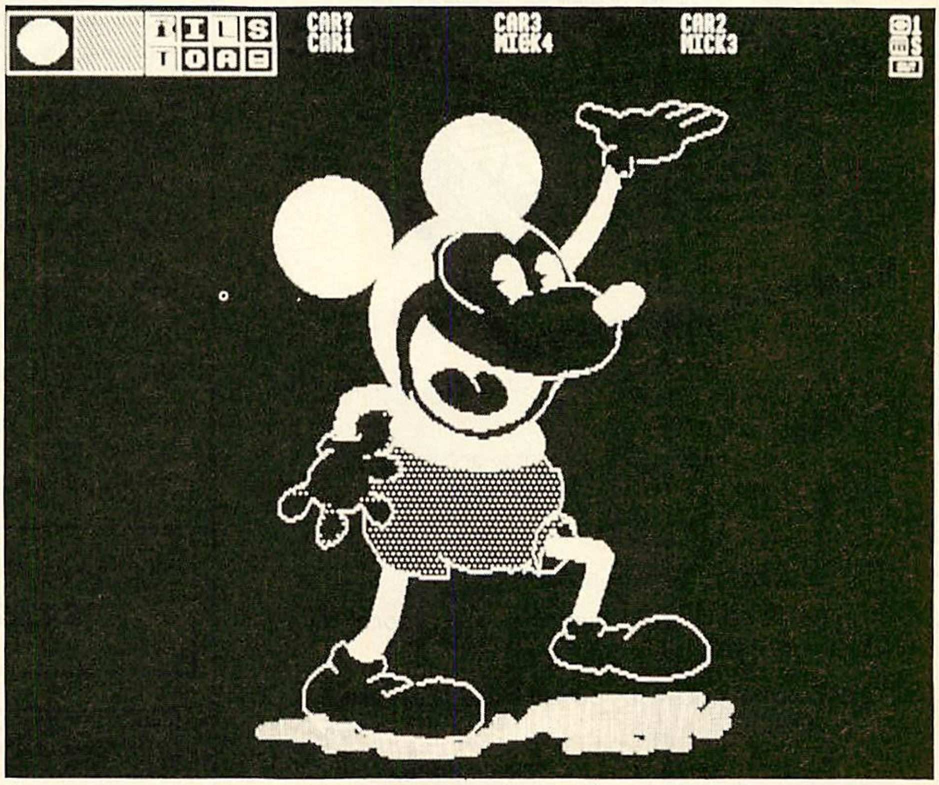
Price: full package £85.00 + VAT (£97.75 incl.).

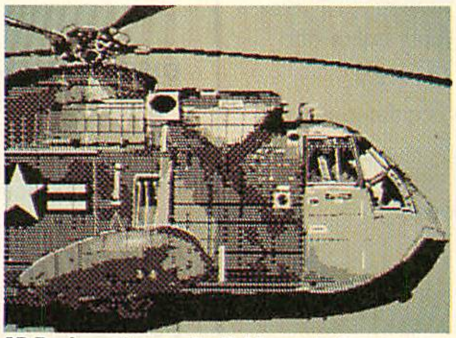
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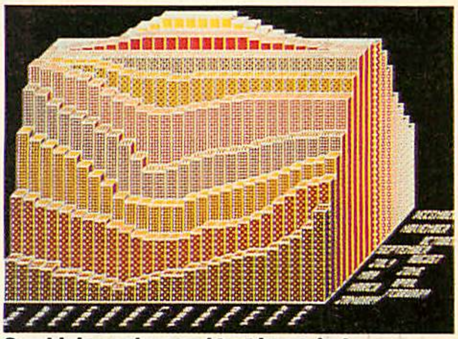


Mickey Mouse shows some of the facilities of *Microbrush* off. On the left we see the start of the head drawn purely with the circle, ellipse and arc routines from the menu. These give unrivalled control over the shapes you can draw, and once the outline is drawn, the rubbing-out, pixel editing and shading-in can begin





AB Designs show potential in mode 0



Combining colour and text in mode 1

to select a letter at a time from a menu bar at the top of the screen (almost like using Letraset). Some characters are not provided, so you have to build these up yourself. The other problem here was that the lines of text overlapped in the default setting. You can cure this, but it was the first of a series of defaults which did not suit my way of doing things.

I did some more sketching but spent a frustrating evening trying to use the shape drawing routines. It turned out that you draw by default in the background colour and have to change the 'rubber' colour to see anything!

Later I tackled Mickey Mouse. Here I used the shape drawing routines to build up the character from circles and arcs. I'd got the hang of using these, and found them unparalled in BBC micro programs.

Other handy bits came to light – and many of them work very quickly – you can create pictures and use them as a paintbrush, flip drawings, add parallel lines, and fill in shapes between points. Some features aren't up to scratch, however. I couldn't find any cut and paste routine and the colour fill wasn't very good at getting into corners. Furthermore, there was no way of stopping it once it started to leak out of a shape. An 'undo' button would be gratefully received.

The thing which the program does best though, is exploit dot-matrix printers. The range of possible dumps is amazing and the quality of image is really only limited by how long you want your printer to carry on and the number of ribbons available. Colour dumps can be done on an Integrex.

A unique feature of *Microbrush* is the ability to add your own routines as disc-based star commands. This is done in assembler, and examples are given in the manual. Most of the program is compatible with the 6502 second processor.

To get to grips with *Microbrush* fully would take months, and it really is for people with a lot of graphic ability. You need a lot of patience as it's impossible to go straight in, and the 130-odd page manual takes some studying. I like software that you can sit down to and use instinctively, at least at a simple level, and *Microbrush* definitely fails that test. However, *Microbrush* isn't for people who just want a step up from *Super Art*. It is designed to get the best possible results out of a printer. For me, it was just too difficult to use but if you're a perfectionist and are prepared to be patient and careful, that trade-off might be worth making. The pictures on these pages show the abilities of *Microbrush* and the graphic skills of its author, Alan Burns, so I'll let them have the last word. I'd certainly like to hear how readers get on.

The two-ROM version of Microbrush *costs £150 for the BBC B and Master. A three-ROM Master-only version costs £200. Both are available from AB Designs, 81 Sutton Common Road, Sutton, Surrey.*

Minimum of £150.00 trade in for any working BBC Model B against any of the products listed below. (With Acorn DFS add £40.00)

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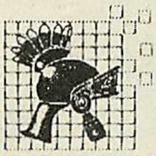
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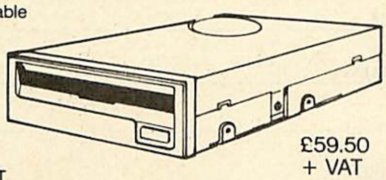
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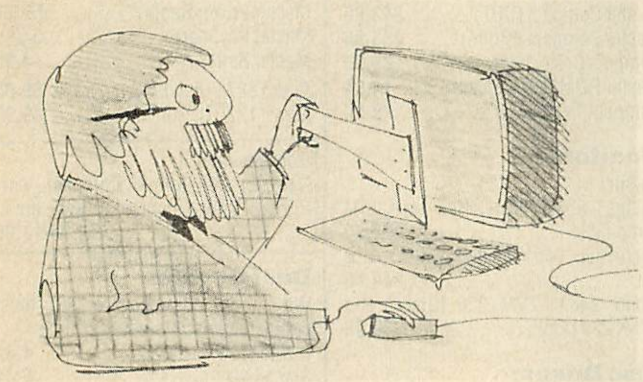
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DTP MANUAL

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Design for Desktop Publishing is a clear guide to the basic principles of page layout, written with the requirements of the micro user mind.

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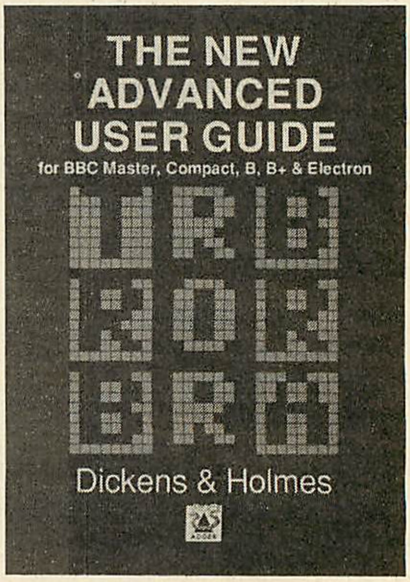
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BUSINESS

MORE OF YOUR IDEAS

***Acorn User* readers have come up with innovative and original uses for their micros, both at home and at work**

Roger Carus

The letters full of ideas for using your BBC micro in business make fascinating reading. Many readers with real achievements in programming seem embarrassed about showing what they have done. The few I can mention here are just a sample, and it is worth pointing out that they are not taken in order of arriving – some of the best early ones have still to appear.

Starting first with ideas where a thoroughly commercial approach is giving a good service, the use of *Wordwise Plus* and a Brother CE-60 typewriter by Nick Widdows of Whitstable to produce a 32-page guide to car ferries from Great Britain and Ireland, shows what can be done. No programming was involved and only the use of the most conventional software.

His idea is not designed as a timetable but as a useful reference book on the ships themselves, and he has illustrated it with a few photographs. It was professionally printed by Crystal Printers of Herne Bay. The whole book is very well done and will be easy to keep up to date.

By contrast, Steve Holland of Chester-le-Street sent a copy of his 'Lotfiles Auction Package' which was written to order for Boldon Auction Galleries in Tyne and Wear. The software is in regular use for all the usual auctioneers purposes. It maintains a database of buyers and sellers and on the items sold. It also produces data on commissions, transport costs and cheque numbers as well as printing accounts.

Obviously the package is highly specialised and has a limited market in which there are several competitors, but the enormous amount of programming involved makes the fee he received small in relation to the work. It does seem to do the job very well, and certainly better than the only other similar program which I have tried out.

In a lighter vein, I was sent 'Second Sight', an oracular program by S Fetherstonhaugh which he advertises and sells through Redwing Design (Borfa Hafod, Tregynon, Powys, Wales SY16 3PZ). As one who cannot resist a horoscope, I enjoyed trying its 96 questions but because they are mostly very general, personal questions, like: 'Can I win the love that I desire?', and because the answers are equally ambiguous, I was a little disappointed. However, the idea is not a bad one.



Nick Widows has produced a car ferry guide

PHOTOGRAPH: BRITTANY FERRIES

Most of us who have tried writing a program to meet our own needs end up with something which has a more general use if only we knew who would like to use it. I spent much of the Christmas holiday in 1985 writing, or rather adapting, a program to help students to identify which of the 46 universities is likely to suit them best for type and location. It works quite well, and is fun for careers conventions, but I doubt if anyone could make a profit out of selling it.

The same applies to many of the programs I have been told of. That said, a surprising number of the correspondents seem to have been paid to write a special program, even where there are good commercial ones which do the same job. I suspect that is often because neither they nor their client knows of the existence of the ones which are already available.

One which certainly was not already available was sent to me along with other interesting items by D N Baron of Otley in West Yorkshire. He has written a program used by Leeds University's Textile Department and Courtaulds Research, for use in the analysis of fibres.

All kinds of fibres can be stretched to breaking point and the voltage, produced by a strain gauge attached to a fibre under test, is read using the micro's analogue port. A standard series of tests for quality control using the micro allows two weeks' conventional testing to be done in a single afternoon. The saving from such a technique probably pays for the whole equipment in two or three days.

Still on textiles, but this time from Ralph Makkinga of Bunnik in The Netherlands, came a program which allows you to create, analyse and store weaving patterns. His was not the first to come from abroad which shows how far the BBC micro and *Acorn User* travel.

His textile designs can be displayed on the screen in various degrees of resolution, and then printed using a graphics screen dump. The program can also be adapted to control a small weaving loom. At present the program works with only two colours, but Ralph is working on the possibility of extending the number.

These programs may seem very technical, but in fact the key to each is seeing ways in which micro technology can assist in the solution of practical problems. If you want to make contact with one of the authors, let me now and I will pass on your letters to them.

Often the programs are not very complicated at all: it is the idea which counts – so let yours inspire others.

IDEAS WANTED

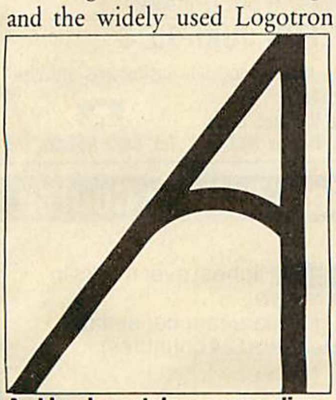
If you have written a piece of useful software making use of your micro for business or pleasure and would like to share your knowledge and experience, write to Roger Carus, c/o *Acorn User*, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ. Or use British Telecom Gold: 81:RED001.

EDUCATION

NEWS

Better Logo set for Arc

An Archimedes Logo is being prepared by Logotron in conjunction with Acorn. This new version appears similar to the existing Logotron Logo, but is considerably faster, and there is a wide range of new primitives. The blending of the best bits of the original Acornsoft Logo and the widely used Logotron version will add up to one of the most powerful Logo environments ever offered on a micro.



Archimedes catalogue expanding

The new package will also support Arthur operating system commands, and take advantage of the many facilities offered by the machine.

■ HS Software has produced an Archimedes compilation disc of all its reading software. This popular material, which puts the building blocks of reading into arcade-game format, is now all on one disc, including the newly released pack 3a.

Owners of BBC B or Master versions can upgrade for only £4.95. Otherwise the compilation will cost £19.95.

CET boss leaves to forge Europe links

Richard Fothergill has resigned as director of the Council for Educational Technology, the body that advises the DES on the use of IT in schools. Fothergill was director of the MEP until March 1986. The move comes at a time when CET's role and funding are under DES scrutiny.



Fothergill: Europe-bound

The CET compiled the 'New Technology for Better Schools' report that led to the DES' latest Educational Support Grant initiative.

Fothergill's resignation follows conflict over the core curriculum. He sees himself distanced from the established policies, and feels the chance of using IT for subject integration is being lost. He plans to expand his links with Europe.

Put Arcs in primary schools, say advisers

Local authorities are making decisions about where to place new computer hardware in schools and colleges.

Ian Birnbaum, Humberside adviser, said that there was too little software to make the Archimedes a viable choice yet and primaries will continue to buy the Master series. But in the future, it could be targetted particularly at primary level because this area has most to gain from software offering ease of use via graphical or even artificially-intelligent user interfaces. Rival 16-bit machines should find a home in the secondary and vocational area where standard MS-DOS software is more relevant.

Agreeing with this primary plan, Sheffield's adviser Bob Hart said 'I strongly believe primaries should be moving towards 32-bit', but agreed the current Master-buying policy should continue for the next two years. Hart also said he was recommending Archimedes for secondary schools now – but not exclusively. Amstrad and Nimbus machines were also being bought for specific applications.

The signs from software houses are that purpose written Archimedes programs, rather than modifications or emulations of Beeb programs, will be aimed at the secondary and technical market. Publishers are looking first to demonstrate their enthusiasm via the more technical products. Nonetheless, a significant number of primary school packages are under way.

Until the distribution of machines among different types of school becomes apparent, it is unlikely that most publishers will do much more than this. But many are producing one or two new products in order to show the world at large they are interested.

■ The reduction in price of the 300 series to £899 for a 305 and £975 for a 310 with colour monitor has hotted up the battle between Acorn and RML for the education market. Acorn's announcement of the 310M and the 8088 emulator running MS-DOS means that many LEAs are now rethinking their buying strategies. The key question, according to Michael Page of Acorn, is 'How long do you expect your equipment to keep you ahead of the technological game?' If you answer two years or less then, according to Acorn, you should have chosen the Arc.

NEWS

Ulster kids win Arc in coin competition

The first school Archimedes in Northern Ireland was received by five children and their teacher at the Education Northern Ireland exhibition in Belfast. The computer was first prize in a Royal Mint competition to design a new £1 coin.

The children of the three-classroom Loanends Primary School in County Antrim collected project work illustrating many aspects of the symbol chosen to grace the coin – the oak tree. An Acorn computer was the obvious prize. The children had used a Domesday interactive video system, on loan from the local teachers' centre, as the main focus of their research. Mrs Ruth Forbes, their teacher, said that the prize would be put into the one classroom in the school still without a computer.

The equipment was presented by former managing director of Acorn, Brian Long.



Children from Loanends school receive their prize

Overnight mail cuts comms cost

Overnight electronic mail saves time and money, according to Interspan. The new system allows users to process both incoming and outgoing mail overnight, at a time when no one else is using the equipment. The system does not add one penny to telephone bills – Interspan phones you! It can even be used in those authorities which forbid modem lines to their schools.

Outgoing mail is prepared and collected into a file which is saved on the communicating micro. At night, Interspan rings into the modem attached to that micro. It collects the file of mail, and delivers a similar file of incoming correspondence. As no call is made, there is no phone charge.

Interspan charges 1p per kilobyte. Educational subscription is £90 a year, which includes £40's worth of free mail, – four megabytes, or about 2000 single page letters. A free trial period of one month is available to interested schools.

Network managers call for DES help

The Econet '87 conference heard calls for more Government assistance for network development. More than 150 delegates attended the conference held at Leicester University, and concluded that a national body was required to help networks reach their full potential.

SDP president Shirley Williams and Ann Irving of the Microelectronics Education Support Unit gave the keynote addresses. They spoke of a future in which the computer network, both local and national, would be an everyday feature of life.

Mrs Williams was keen to stress the importance of planning the curriculum to match the needs of the next 25 years, and was critical of the Tories' 'core curriculum' policies. Ann Irving examined the differing effects of microtechnology on various social groups. She looked towards a future where sufficient resources would be available on line in all schools, and she hoped software would develop to match the power of the new school computers like the Archimedes.

The conference concluded with panel sessions in which delegates discussed the issues of network management, curricular matters and future trends. The conclusions from these panels reflected a growing concern that the problems in exploiting networks to the full need to be overseen by a national body. User groups such as the National Econet User Group provide a vehicle for discussion, but its resources are limited. The conference felt that network use is important enough to warrant other national bodies taking on the support task.

Many delegates called on the DES for assistance in the development of an appropriate body. Concern that so much responsibility placed on individual teachers for the upkeep of networks was also expressed.

Extended Plane Designer takes off

Plane Designer, the CDT package from IC Software, has now been extended. In addition to the normal facilities which allow you to design balsawood planes, there is now a 3-D version. This enables you to generate a 3-D fuselage, complete with all formers. These may even be modified to take rubber-band or electric power. The software allows designs to be drawn on paper by plotters like the Plotmate.

IC Software is hoping to market similar *Boat Designer* and *Car Designer* packages in the near future.

DESIGN FOR LIFE

When teaching design and technology, it should be based on problem-solving and relate to the real world

Chris Drage and Nick Evans

Eighty per cent of school time should be devoted to maths, languages and technology according to current HMI thinking and the latest national curriculum proposals. Not surprisingly, this has worried many teachers because they fear the erosion of traditional subjects, especially those seen to be 'minority'. There is also the concern that they may not be adequately trained to teach technology topics of which they have little clear understanding. The certain fact is that this initiative will affect schools.

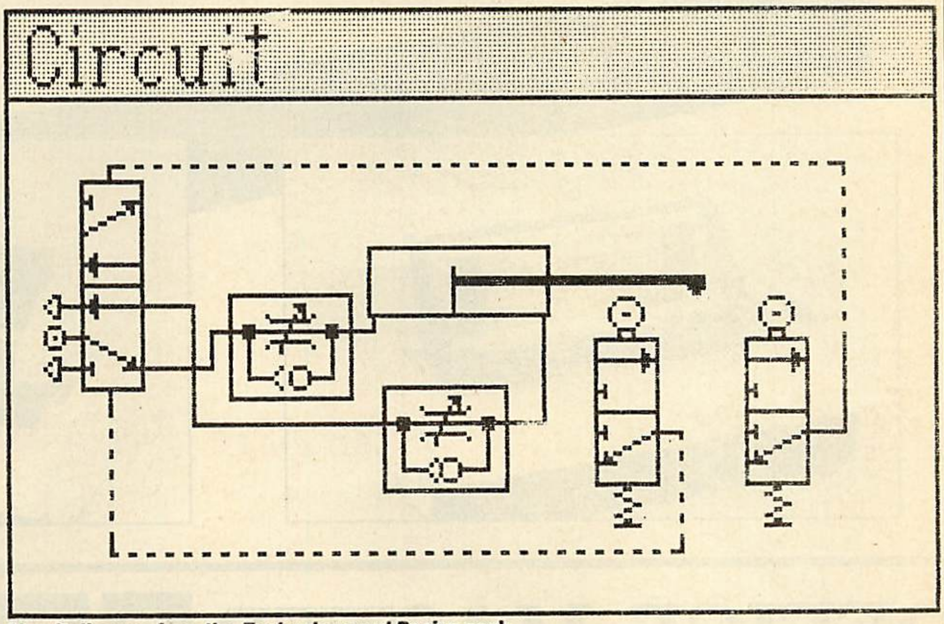
So what is 'technology'? BBC Soft's *Technology and Design* pack comes complete with a definition:

'The purposeful use by the human race of skills, knowledge, materials and energy to produce artifacts and systems that will improve the quality of life.'

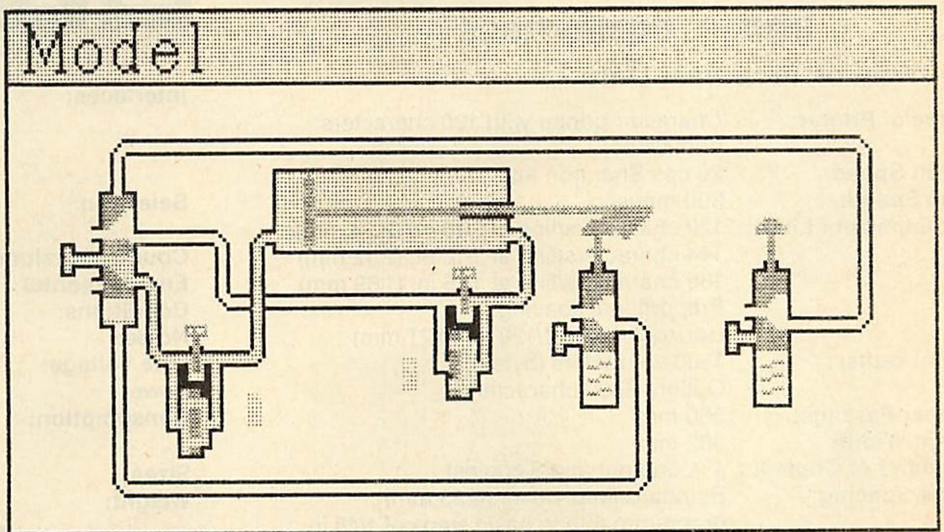
This points out that technology is not a skill to be acquired or a subject to be learnt. It's a process by which man manages and improves the environment. Children should be trained for an awareness of the environment in which they will live as working adults – one where 'skills, knowledge, materials and energy', are directed towards solving humanity's problems, big and small. For this reason, there is a heavy weighting on technology in the future curricula that are being proposed. In reality, many of the traditional areas of schooling fit into this broad model – all that is changing is the emphasis.

The BBC's radio and television programs in the *Technology and Design* series are just about to go out again, starting on March 7. The series has already been used successfully by many schools to introduce technology into the curriculum. It is now about to be extended by the addition of further software materials.

One of the key intentions in the selection of the material was to make them 'multi-media'. It is not targetted at any specific audience. The aim is for it to be used in a modular fashion – units dropping into the school day where and when appropriate. Naturally, it has a secondary use as a coherent, continuous set of course materials, and it aims to cover designing solutions to a wide range of problems.



Circuit diagram from the *Technology and Design* pack



A model from the pneumatics section

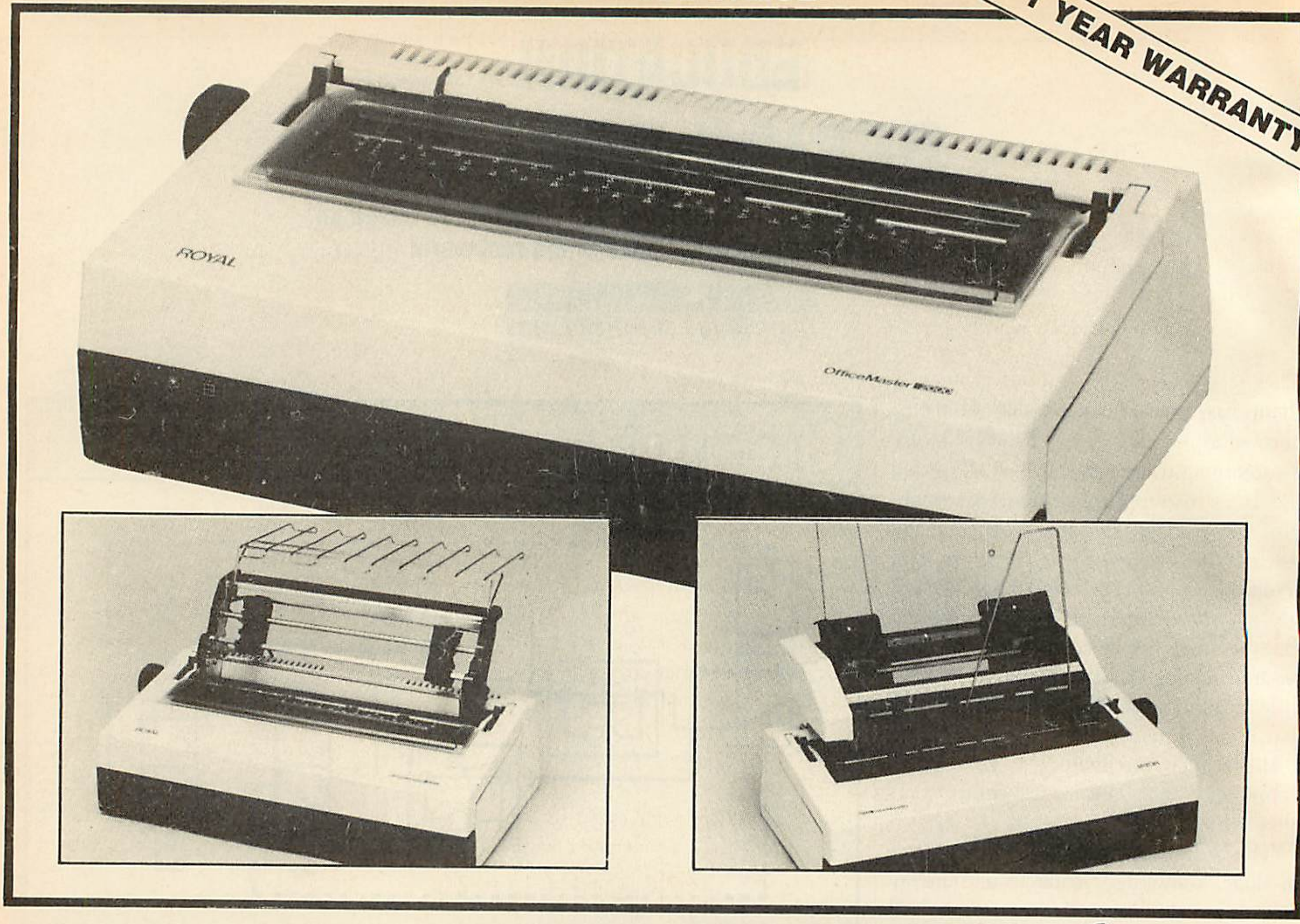
Julian Coleman, BBC series editor and driving force behind much of the material, says that some of the units are accessible, others more difficult to integrate into the curriculum. But throughout, he stresses, the approach is never more complex or obscure than any topic absolutely requires. In other words, if the child can understand the unit's content, he or she is likely to be able to tackle the topic as a whole.

Technology and Design is a very thoughtful pack – it's philosophy has its roots firmly fixed in the current HMI way of thinking and the Government's national curriculum proposals.

'Problems-solving' is the educationalist's buzz-word of the decade. So many teachers ask: 'How can I do problem-solving?' Peter Dixon, a noted art education adviser in the south of England, practised in many schools. He believes that most of the problems that pupils are set by teachers intent on keeping up with the latest thinking, are merely 'doing what

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Print Buffer:	1500 characters (bytes) Option: 3500 characters
Paper Passage:	360 mm
Print Width:	302 mm
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Selection:	Completely able for text processing (ESC-sequences)
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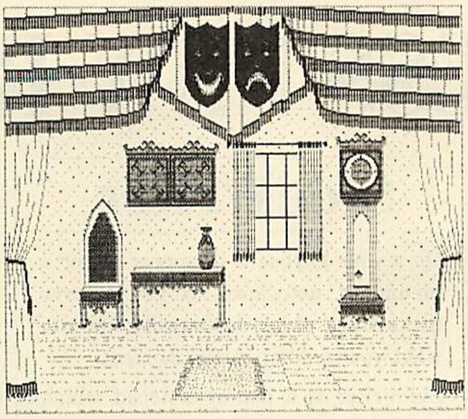
they are told'. In one of his many excellent pamphlets Dixon asks: 'Whose problem is it, the teacher's or the child's?' He cites an example – a group of children asked to design an apparatus to suspend an Oxo cube 12 inches in the air using straws and rubber bands. The question is, how often do you need to suspend Oxo cubes 12 inches in the air? This abstract problem-solving has received a good deal of criticism simply because it has no clear relevance to the child's life or prospects.

BBC Soft's *Technology and Design* tackles this problem by looking at themes involved in the process of technological design, and then sees how a variety of real problems are dealt with. The pupils are encouraged to follow through the thinking that has led to a particular solution, and to offer hypotheses or alternative solutions of their own. The use of particular construction materials and fastenings is discussed; the role of motive power and the different ways in which the same end result may be reached, the strengths and weaknesses of particular structures, and methods of improving the efficiency of mechanical devices by different gearings and linkages are all tackled in a friendly and positive way. All the examples are related to real-world situations and equipment that children are likely to encounter.

Traditionally, the only environment in which this sort of work was done was the CDT department, under its various titles. Now this material covers a broader range of areas, because it also addresses social, aesthetic and moral problems, not just the 'hardware' aspects of the technology itself. For example one of the audio tapes looks at a rarely-tackled aspect of the design question – does the design relate to the needs of the market-place? The study of the development, marketing and subsequent failure of the Sinclair C5 electric tricycle is an excellent case-study.

The purpose of the *Technology and Design* project is three-fold. It seeks to teach knowledge of energy, materials and control. It aims to raise skills of investigation, invention, implementation, evaluation and communication. And it tries to import aesthetic, moral, technical and economic values to the learner.

The materials related to the project come in a number of forms, since there are several different media involved. The radio programmes are broadcast during schools service times and may be recorded by schools and retained for the usual three years. Information on timing of these and



Learn electronics with the 'Haunted Stage'

of the TV programmes may be obtained from the Educational Broadcasting Information Line (24-hours) on 01-991 8031.

The TV programmes cover the topics of packaging, sorting and moving. They also take a detailed look at specific design issues relating to problems in the real world. So, for example, the 'moving' programme looks at the development and design of the 'Africar' – a largely wooden all-terrain car. It is designed to be built, and also maintained, with locally available materials in third world countries. Viewers are encouraged to try designing their own vehicles to undertake specific tasks.

The radio programmes divide into two types. First, there are programmes which provide foundation knowledge, and encourage pupils to develp skills which they will need to use with the other materials. Second, there are the four 20-minute units which are designed to look at technology in context – how a solution can affect the wider world.

A substantial portion of the first group of programmes are used with Computer Synchronised Audio (CSA) – a technique which BBC Soft has used in much of their material of recent years. This method of linking the audio tape with what goes on in a computer program means that one may be made to illustrate the other. The tape provides a commentary on the program. At the same time, the listener may be provided with a means to practise the skill that is being tutored. These radio programmes are supplied on tape, along with the complete software packs. There is also a set of 64 slides which are designed to complement the four longer radio programmes.

This leads naturally to the computer programs, which come on disc, complete with the CSA tapes and a handbook. This booklet contains non-copyright (photocopiable) pages, as do all the printed materials with this pack. These do not just repeat the content of the programs, but extend it by posing problems that grow out of what has already been tackled. In addition, notes explain the working of the open-ended software for cases where the programs are used without CSA.

The programs cover structures, gearing and linkages, motors, pneumatics and electronics systems. As an example of the techniques used, the pneumatics section takes the user from the simplest basics of valves and cylinders. The illustration of these is performed on screen in two ways – both as a model and as the schematic which is the British Standard symbol for the device. All parts of both illustrations move correctly and the actions and reactions are clearly visible. The program guides the user through stages in which the idea of a two-way shuttle-valve is introduced, then the ability to slow down the action of the cylinders without losing their power, and subsequently the use of multiple-valves. At the end of the program the user should have a clear idea of the basic elements of this technology. The work is then developed further by providing a calculator to establish the correct size of cylinder needed for a particular air pressure and required force. From this point on, it is up to the teacher to provide the content of any further development.

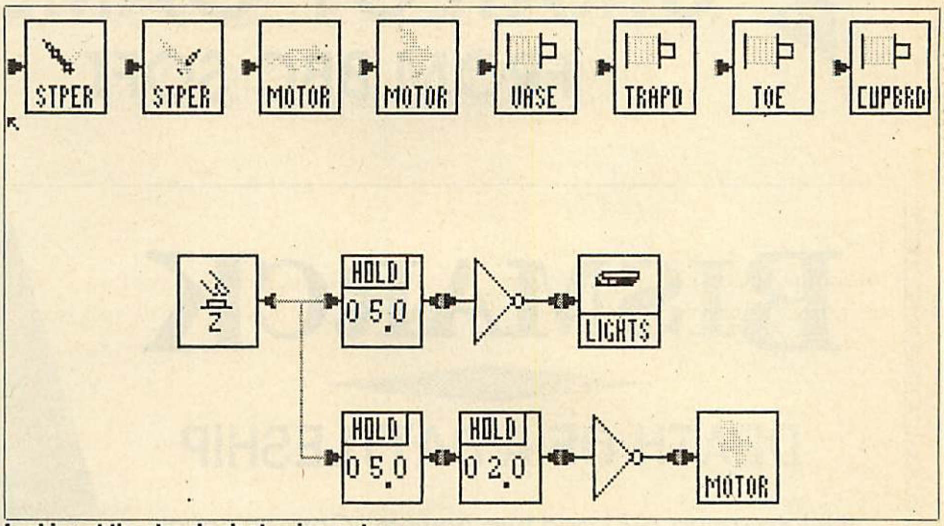
The principle of modular elements on screen is a great strength of these programs. The provision of a range of, for example, graphical building blocks for electronic components which many be linked together and tested on screen, is an idea that is increasingly being used in good quality simulations. The first advantage is that it costs nothing – no components are purchased, soldered or damaged. Moreover, there is no danger. The pneumatic cylinders described will not crush any fingers with their unexpected power. That makes otherwise dangerous topics like mains or high-voltage electricity a practical proposition. It is also possible for many people to use the same 'equipment' at the same time for their experimentation. Just ask any CDT teacher who uses the same construction kits with five different classes how valuable that can be!

In the structures section, you can build and place test loads on a variety of structures, without consumption of materials. Once a principle is established, the fact may be proved with construction material at later date. The most fascinating program in this set is the electronic systems unit. This allows you to control the 'Haunted

Stage'. Theatrical stage effects may be controlled by designing control systems to manipulate the lights, the trap-doors, the bat and all the other mysterious goings-on. This is made possible by having an editor in which the various elements may be linked together and timed or activated. In test mode, the efficacy of the system may then be tried out and finally, when you are sure that you have done exactly what you wanted, the scenario produced may be watched from start to finish; the program gives you an outsider's view of the Haunted Stage itself.

This is not intended to be a training pack for would-be theatrical technicians; it's an exercise in understanding system design with specific relationship to electronics. The computer synthesised soundtrack helps you to get to grips with the principles, and then you're free to design as many variations as you want.

New follow up materials are presently being designed to complement the existing *Technology and Design* software. They will be available early in 1988. There'll be software covering various topics including sorting, moving and packing. Again, these programs are likely to take an unusual and interesting standpoint, so that, for example, the sorting element will be 'an adventure of sorts' – an adventure game which centres on the sorting of data in order to solve problems.



Looking at the stage's electronics system

Technology and Design is one of the most ambitious and comprehensive sets of materials to cover the teaching of design skills across a broad range of ages. Its strength lies in its modularity, its use of several media and its inventiveness, which makes it a lively, interesting and entertaining tool for pupil and teacher alike.

The series was prepared in collaboration with British Schools Technology, The Gatsby Charitable Foundation. The Smallpiece Trust and Brunel University.

Materials are available from BBC Publications (Schools), PO Box 234, London SE1 3TH. Tel: 01-407 5762/3/4.

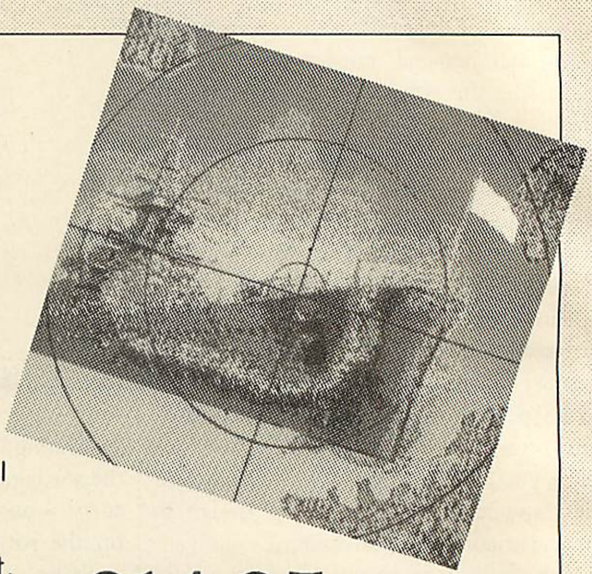
Software/CSA Pack: £24.95, Radiovision Slide Pack: £14.38, Teacher's Notes: £2.

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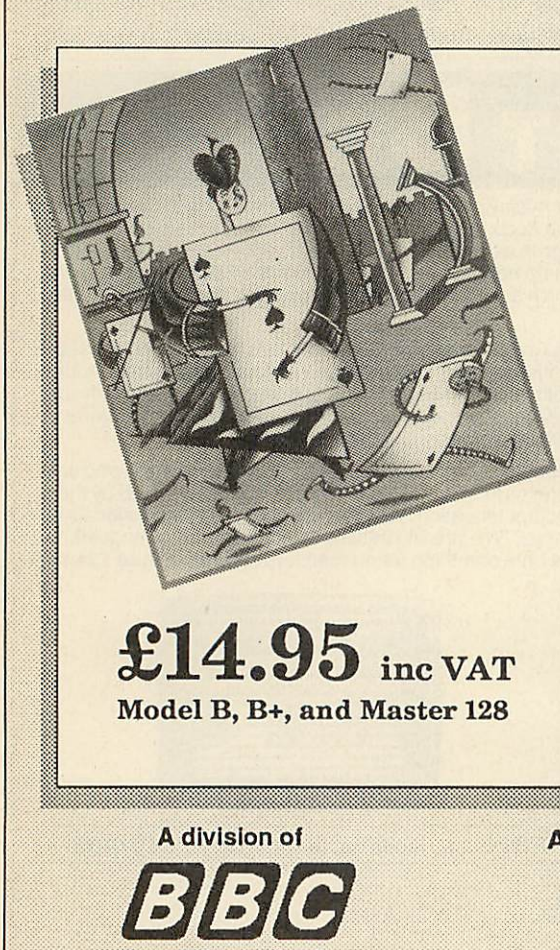
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BBC Soft's chess program, *White Knight Mk 12*, is still available for £18.95 on 5.25" disc or £14.95 on 3.5" disc.

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THE NETWORK PAGE

Another device to check that the vital leads of your network are working properly

Robin Newman

The network cable tester checks the main network cable for healthy operation. The device can also be used to detect computers whose 75159 Econet line driver chips may be faulty. The simple circuit, shown in figure 1 (opposite), makes it easy to connect a voltmeter to the data lines of the network cable. The switch allows you to measure in turn the voltage between the D+ data line and the Earth, and the D− data line and the Earth. Two LEDs are also connected back-to-back across the two clock lines, C+ and C−. Construction of the circuit is simple, and it can be built in any convenient sized plastic box. You can simply cut a normal Econet lead in half to save wiring up the DIN plug. Any school science department should have little difficulty building the unit.

The test unit can be used systematically to examine a complete Econet installation. First, disconnect everything from the main cable network, except for the clock box and the two terminators. You should then connect the test unit to a suitable multimeter, switched to a DC voltage range of five or 10 volts full scale deflection. Then insert the DIN plug connected to the test unit into an Econet socket which is connected to the cable.

If both LEDs glow, one perhaps slightly brighter than the other, then the clock is working, and the clock signals are both reaching the socket under test. Note, however, that if in the rare case that your clock is set to a very asymmetric mark/space ratio, then you may find that one LED fails to light. Temporarily reset the clock mark/space ratio if this is the case. See the Econet installation guide or SJ clock manual for details of how to do this.

If the D+ line is selected with the switch, the voltmeter should read approximately 2.1 to 2.2 Volts, but slightly lower readings are acceptable. With the D− line selected the voltmeter should read approximately 1.7 to 1.8 Volts. Again, if the D+ voltage is lower then this reading may be lower too.

If the D+ and D− readings are zero, then either the network terminator is not connected, or there is a break in the relevant data wire or the Earth line. Another possibility is a short circuit between the two of them. All the network sockets can be checked one by one, and any faults isolated to one particular stretch of cable between a 'working' socket and a faulty one.

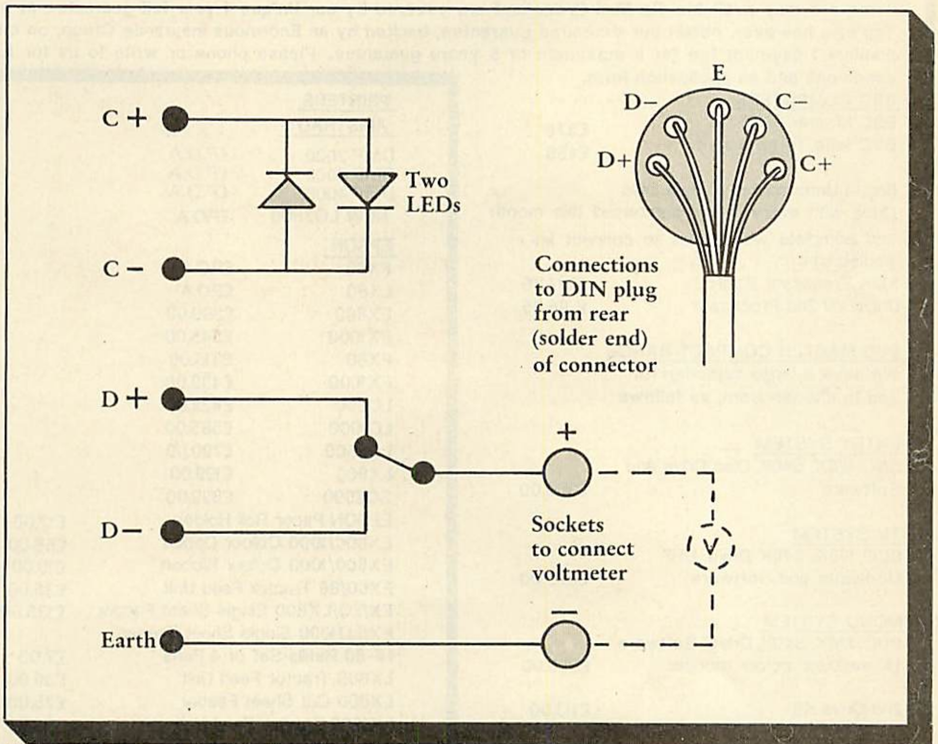


Figure 1: A network lead testing device

Having checked the cable, the computers can be re-connected one at at time, while monitoring the data line voltages at another socket. Any machines which cause the voltages to change dramatically as they are plugged in may well have faulty line driver chips – marked as IC 93 (75159) on a model B computer or IC 3 (AM26LS30) on the Econet module in a Master series or Archimedes computer. In reality, the chip may still be working, but should have a careful eye kept on it as it may be near to failure. As further machines are added to the network, the voltages measured on the data lines will normally drop slightly. This is unimportant – what you are looking for is dramatic changes when an individual machine is connected or disconnected.

Recently our school network was behaving rather sluggishly. This was traced to two separate breaks in the network cable earth. The cable was solid cored, and had fractured at the connector joining it to a network socket. To isolate this fault, all of the computers had to be disconnected from the network. If this isn't done, the earth in the mains lead connected to each of the computers earths the network on the far side of the cable break, masking the fault and allowing sluggish network operation.

For a similar reason, it is very important to earth all the network machines effectively. If the mains lead earth connection is poor, then current can flow through the DIN lead to the network cable's earth connection. The heavy current which flows can cause the line driver chips to be destroyed as the computer's switched-mode power supplies are switched off and on. The lesson is to carefully check the mains lead earth on machines which develop faulty line driver chips.

The cable tester device was designed by Chris Dawkins at Felstead School.

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ACORN USER ADVERTISEMENT PAGES – JANUARY 1988

FREE ADS

Penpals (teenage) wanted to swap hints tips, etc. Preferably Electron, but I don't mind. 48 Dallas Brett Crescent, Folkestone, Kent CT19 6NE.

Archimedes Penpals wanted to swap ideas. Vincent Warren, 1 Forge Close Poringland, Norwich, Norfolk. NR14 7SZ (05086) 3517.

Penpal wanted with interest in computers. R. Kirshaw 16/8 St. Lucias Street, Kotahena, Colombo-13, Sri Lanka.

Penpal wanted with Archimedes. Kost Goumas 21 Adramitiu Street, N. Smirai, Athens 171 21 Greece.

Master 128k with 512k upgrade (IBM – compatible), medium res. Microvitec monitor 1451AP, twin drives, extras, software. £800. (0924) 840129 evenings.

Wanted Diablo 1650 service manual and ROMS or ROM images for sheet feed controller. Carl (0922) 692113.

BBC 32k Acorn 1770 DES plus Midwich 40/80T, 400k, single disc drive, manuals. *]Mini Office II*, games £225. (08926) 61011.

OPUS 256k Challenger drive plus replay 1770 version £150. Solidisk two/meg 128k sideways RAM £50. Chris 4pm 9pm 01-549 8621.

Acorn Electron with Plus 1 and Plus 3 *View* and *ViewSheet* and many manuals £225. (0933) 311657, Rushden Northants, Alan Ward.

BBC B+ 128k, OS 2.00, DES 2.22, ADFS 1.3, GXR 2.00, all manuals support discs etc. £350. Rotherham (0709) 370112.

Intertec Superbrain 64k, with drives and monitor, £250. Tel: Mark (0296) 88064.

Teletext adapter (Morley), software plus manual for sale. Excellent Christmas gift. £60 ono. One year old and hardly used. Tel. 01-936 3256 Martin.

Electron advanced Plus five interface plus AMX Mouse plus AMX art software. Worth £125, sell for £80. Tel. Reading 690288.

Wanted: utilities disc for *Starbase* database, cash or swap. John 01-805 2446 after 6pm.

Robocom Bitstik 2. Master compatible including manuals, plotter driver. boxed £550 ono. Tel: (0676) 23288 Edwards.

Electron 64k, Plus 1, Plus 3, 5 ROMs, 10 discs and *Elbug/Electron User* Over £100 worth of games. £250 ono. (0734) 701161.

Solidisk WD-1770 + 8271 interface £30. 100k drive £35. RH light pen £20. Atari trak ball £10. Tel. (0482) 640539.

Electron Plus 1, Plus 3 16k S/RAM ACP toolkit DFS, *Views* Lisp games. £200. Will split. Buyer collects. Burton 211996.

Discs Sony 3½ 80T DSDD box 10 £15. 3M 5¼ box 10. Tel. Chris, Canterbury 459172.

BBC B, monitor, Watford ROM/RAM with 2x8k RAM 40/80 DSDD, Watford DDOFS, Watford EPROM programmer Sanyo 0R101. £350. Tel. 01-556 7000.

BBC books and some programs on tape, Tandy CGP printer. All for £50 ono. Will split. (0452) 864702.

BBC B with Pascal chips, dual 40/80-track disc drive, DDFS interface, Brother printer plus games. £600. 8 Ribble Road, Coventry.

BBC B DFS 40/80 drive, 32k SWR, *View* cassette recorder, Books, manuals, software, tape/disc. Valued £800 + sell for £380. Tel. (0602) 723178 anytime.

BBC B 1.2 O.S., DNFS, monitor plus numerous peripherals plus vast range of software. (0608) 61382 weekends.

Electron, Plus 1, Plus 3, *View, ViewSheet,* 1770 DFS, as new. Software, manuals, discs, included. £250 ono. 01-290 5835.

Electron software, data recorder, books, excellent condition £70 or with Philips green monitor. £140 ono 01-747 3202.

Opus 40-track single side disc drive. Good condition - £45 (Cardiff) (0222) 750591 after 5pm.

P-System for 6502 2nd Proc £50. Pro-Pascal £50 BDCS C £40. Both Torch format *W/Wise Plus* £25 (0532) 779050.

BBC B 1.2 OS 0.9 DFS £200, Philips monitor £40. EPROM programmer £13, *Acorn User* 2-62. Offers. (0477) 34719.

BBC B OS 1.2 DNFS 6502 Second Processor complete, 40 track, drive, manuals, discs £300 ono. The Manor Chalgrove, Oxford. (0865) 890836.

BBC B, issue 7, Acorn DFS, + DS80/40 drive, APTL ROM board, Shadow RAM, green monitor, in console. £550. (0865) 274396.

BBC B, Viglen DFS, *View* 3.0 and Brother Hr-19 daisy wheel. Good wp kit. Offers £300+. 01-941 5134.

Acorn printer AP100A with Centronics cable. Ideal first printer £50. Morpeth (0670) 860170.

For sale Two 2k battery backed RAM £80. 16k battery backed £20. Both with software. (0903) 772845, Iain.

Epson LX86 printer, tractor feed, 1500 sheets of paper. Bought April 1987. Cost £295. Sell £160. V.g.c. (035389) 273.

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First Byte printer interface for Electron £15. George, 80 Kingsdown Parade, Bristol 6.

Wanted for Electron: Plus 3 or equivalent. Also printer (send sample). Kramer 173 Sharde Green Lane, Fulwood, Preston PR2 4HE.

For sale: Ultra slimline 40 Track/DS disc drive £65. Torch 80 2nd processor, No manuals, £50. Pontypridd (0443) 480201.

BBC B OS 1.2 issue 7, Watford ROM board, 16k sideways RAM, ROMs, manuals (including advanced), 40/80 drive £380. (0763) 72317 after 6pm.

BBC B DFS, 40/80 disc drive as new. Games. £300 ono. (0223) 835430.

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Wanted Juki 6100 in good condition. Pay £200 - NJ Osborn, 99 Mercury Close, Lordsmill, Southampton

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Cumana dual 800k, power supply drives. Unwanted gift £150. ROMS 16k 64k £2.00 £3.00 each (0992) 443511.

Master 128 £350 medium res Microvitec 1451, £175. ROMs and disc software half price or less. (0925) 811548.

Electron E2P Second Processor with operating software £46. ono. Chard (0460) 67883 evenings.

Econet terminators and clock c/w PSW's unused £15. Econet printer/file server software, unused. £20. Tony Southampton. (0703) 263618.

Plus 1 5.225in DFS, tape to disc ROM, *View,* Lisp, manuals, Electron software, £80. 01-464 0048 evenings.

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BBC B for sale with 40/80 drive, mouse. ROMs. Including *Replay.* Loads of discs, tapes, recorder etc. Paul (0268) 42385 £500 ono.

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BBC B DFS. External ROM/RAM board with PSU, Toolkit + *Examon, Starbase, Manager* ROMs manuals £325 (0268) 413228.

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ACORN USER'S

DIARY

The bells, the bells!

Our phones have been jammed recently with technical queries about the BBC micro. If you have a problem with any of *Acorn User*'s own software, then enquiries can be dealt with, but ring on Wednesday or Thursday afternoon, please.

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The board with no number

Russell Jackson wanted to tell *Acorn User* about a couple of things, so he sent us a letter. He told us all about his 24-hour bulletin board, and included details of the baud rates and lots of stuff about what we could see on the board. But did he include a number to call?

And the second item? Take a look at the letter. Russell also suggested we 'contach' him, 'tanhked' us for our interest and promised he was 'sedning' details of the software. He sells a typing tutor program.

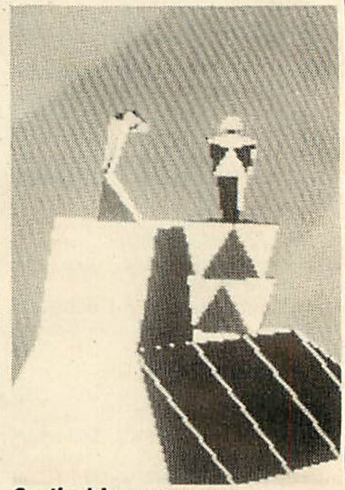
```
Bulletin Board info:-24 hours
                     1200/75,300/300 Baud Rates
                     Viewdata and scrolling
                     Includes Cug ,Acorn technical advice,private and
                     general messaging ,lost of downloads,Sysop Says
                     Gossip Column and lots more..

(The BB is currently of line form a week from now because of Hard Disc
installation!)
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All the details, bar one

No mean feat on the tower

We've had exactly no entries for our *Sentinel* competition, set back in June 1987! Briefly, we wanted you to answer a few easy questions, and to send us a photograph of a meanie on the *Sentinel*'s tower. Impossible? Well, not quite, as the photograph from *Acorn User*'s very own games supremo David Lawrence shows.



***Sentinel:* Lonesome no more**

It can be done, by absorbing the *Sentinel*, then waiting around until a sentry creates a meanie. He'll create a tree first, then mutate it into a meanie after a while.

The competition's been kept open a little longer, if any of you still want to have a go. If you haven't got June's edition of *Acorn User* you can order back issues from the order form on page 129.

It could well be worth it to win *Acorn User*'s number one game of 1987.

POST A PROBLEM

Acorn User has a guaranteed fast reply service for enquiries. Your answer will be returned within 10 working days for just £3 (includes VAT), or your money back.

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Please note: debugging readers' programs or those from other magazines is a complex task and we cannot guarantee to give a full solution. Unless the problem can be spotted quickly, the service will only be able to make general comments or suggest a strategy for the reader.

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Date out:
Answered by:


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